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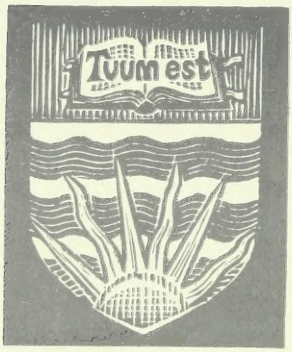

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DOMINION EXPERIMENTAL FARMS

CONFERENCE *of* OFFICERS

Held at Ottawa, January 14-19, 1915

REPORT OF PROCEEDINGS

Part I. Regular Sessions
Part II. Addresses at Luncheons
Part III. Special Articles

OTTAWA
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Some of the Superintendents and Central Farm Officers.

LIST OF OFFICERS PRESENT.

The Director.....J. H. Grisdale, B.Agr.
The Assistant Director.....Frank T. Shutt, D.Sc.

The Superintendent at—
Charlottetown, P.E.I.....J. A. Clark, B.S.A.
Fredericton, N.B.....W. W. Hubbard.
Nappan, N.S.....W. W. Baird, B.S.A.
Kentville, N.S.....W. S. Blair.
Ste. Anne de la Pocatière, Que....Jos. Begin.
Cap Rouge, Que.....G. A. Langelier.
Lennoxville, Que.....J. A. McClary.
Brandon, Man.....W. C. McKillican, B.S.A.
Rosthern, Sask.....W. A. Munro, B.A., B.S.A
Scott, Sask.....M.J. Tinline B.S.A.(acting)
Lethbridge, Alta.....W. H. Fairfield, M.S.
Lacombe, Alta.....G. H. Hutton, B.S.A.
Agassiz, B.C.....P. H. Moore, B.S.A.
Summerland, B.C.....R. H. Helmer.
Invermere, B.C.....G. E. Parham.

Central Farm Officers—
The Dominion Field Husbandman (Acting)—
J. H. Grisdale, B.Agr.
The Dominion Chemist.....Frank T. Shutt, D.Sc.
The Dominion Horticulturist.....W. T. Macoun.
The Dominion Cerealist.....C. E. Saunders, Ph.D.
The Dominion Botanist.....H. T. Güssow.
The Dominion Animal Husbandman.....E.S. Archibald, B.A.,B.S.A.
The Dominion Agrostologist.....M. O. Malte, Ph.D.
The Dominion Poultry Husbandman.....F. C. Elford.
The Tobacco Husbandman.....F. Charlan.
The Apiarist.....F. W. L. Sladen.
Chief, Extension and Publicity...J. F. Watson.

Speakers at Luncheons.

Friday, January 15—
The Live Stock Commissioner.....Mr. John Bright.
The Veterinary Director General.....Dr. Torrance.
Saturday, January 16—
The Dairy and Cold Storage Commissioner.....Mr. J. A. Ruddick.
The Seed Commissioner.....Mr. G. H. Clark.
Monday, January 18—
The Fruit Commissioner.....Mr. D. Johnson.
The Dominion Entomologist.....Dr. C. G. Hewitt.
The Accountant, Department of Agriculture.....Mr. F. C. Chittick.

PROGRAMME OF SESSIONS.

THURSDAY, JANUARY 14.

P.M. 2.00 Superintendents meet at Director's office.
2.00 to 3.00. Opening Meeting.—Mr Grisdale.
3.00 to 4.00. Forage Plants.—Dr. Malte.
4.00 to 5.30. Apiculture.—Mr. Sladen.

FRIDAY, JANUARY 15.

A.M. 9.00 to 11.00. Cereals.—Dr. Saunders.
11.00 to 12.30. Horticulture.—Mr. Macoun.

Luncheon, 12.30 to 2.30.
(Speakers: Dr. Torrance and Mr. Bright.)

P.M. 2.30 to 4.00. Exhibition Work.—Mr. Watson.
4.00 to 5.30. Eastern and British Columbia Superintendents.
Fertilizer Experiments.—Dr. Shutt.
Prairie Superintendents.
Field Husbandry.—Mr. Grisdale.

SATURDAY, JANUARY 16.

A.M. 9.00 to 11.00. Disease-free Potatoes.—Mr. Güssow.
11.00 to 12.30. Animal Husbandry.—Mr. Archibald.

Luncheon, 12.30 to 2.30.
(Speakers: Mr. Ruddick and Mr. Clark.)

P.M. Individual discussions among officers.
Evening. Extra Meeting. General discussion with Director.

Monday, January 18.

A.M. 9.00 to 12.00. Poultry.—Mr. Elford.
12.00 to 12.30. Visit to Biological Laboratory.

Luncheon, 12.30 to 2.30.
(Speakers: Mr. Johnson, Dr. Hewitt, Mr. Chittick.)

P.M. 2.30 to 5.00. Inspection of Live Stock and Buildings.
Evening. Extra Meeting. General discussion.

Tuesday, January 19.

A.M. 9.00 to 10.30. Prairie Superintendents:
Soil Moisture Experiments—Dr. Shutt.
Eastern and British Columbia Superintendents:
Field Husbandry.—Mr. Grisdale.
10.30 to 12.30. Visit to the Seed Commissioner's Laboratory and to the Entomological Laboratory.
Afternoon and Evening.—The Fat Stock Show.

PART I.

Proceedings of Regular Sessions.

PROCEEDINGS AT THE CONFERENCE BETWEEN THE SUPERINTENDENTS OF THE BRANCH FARMS AND THE OFFICERS AT THE CENTRAL FARM.

Thursday, January 14, at 2.15 p.m.

FIRST MEETING.

The Director, Mr. J. H. Grisdale presiding.

MR. GRISDALE: I am glad to be able to welcome here the Superintendents of our branch Experimental Farms and Stations, and am pleased to do so for one reason especially, namely, that I hardly expected to have this privilege this year. I was obliged to make a number of representations to the Hon. Mr. Burrell, backed up by the strongest arguments I could advance in favour of this reunion, in order to obtain his sanction. I hope that you will bear out the claims I have made that a meeting of the Superintendents at this time would be productive of the greatest benefit, not only to the Superintendents themselves, but also to our Experimental Farms individually and collectively and, finally, to agriculture throughout the Dominion.

I have thought for a long time that, considering the policy we are pursuing, there are many reasons for the holding of more frequent meetings for discussion and planning, under conditions such as these. I hope that each of you will make the best use of the time while here. The period covered by our meetings is a little longer than had been anticipated, and yet is not quite as long as I think we could use profitably. Five days is quite a long time; yet I do not think we should separate before completing our work here.

The arguments which I used in discussing with the Hon. Minister the advisability of holding these meetings were varied. I mention to you here the advantages which I pointed out to

him, thinking they may lead to suggestions on your part, which I shall be glad to receive and, if possible, act upon.

(1) Each Superintendent will meet the others and also our officers here under circumstances where he is free from the many cares which occupy his attention on his own Farm or Station and which prevent him from taking just as seriously as he might the visits of our divisional officers and myself. You are here free from your everyday worries, and we hope to provide you each day with something fresh to consider.

2) Each of you will feel that, while he is Superintendent of a Farm or Station, he is also part of the system, and that he is not only interested in agriculture in Prince Edward Island, Vancouver Island, Manitoba, or a small part of Saskatchewan, but also in agriculture as it affects the Dominion of Canada.

It is necessary that we should co-operate more fully and follow each other's work. We cannot follow out exactly the same lines of work at all the Farms, but we can do so to a great extent. Live stock work, fertilizer experiments, horticulture, forage crops, and cereal investigations, if not carried on in precisely the same way at all the Farms, can be carried on in a similar way, having due regard to diversity of climate. This will establish a great common bond among us, and it is to help develop this co-ordination and common bond that you have been asked here.

If you leave Ottawa not feeling that you are a part of the Experimental Farms system, I shall be disappointed in this re-union and shall feel that the time and money spent in bringing you together have been spent in vain. I would repeat that I wish you to bear in mind that the principal object in these gatherings is the establishment of the feeling that we are a homogeneous whole and that we are working with and for each other, not merely for the Okanagan or Alberta, but for Canada.

(3) Another feature is that you will become better acquainted with the lines of work being carried on here. We are fortunate at Ottawa in having climatic conditions which are comparable with those at most of our branches, with the exception of the driest. We find it necessary here to use dry-farming methods; we also find we must employ a good system of drainage. We have very low temperatures and also very hot weather. The work with fruits is conducted with less difficulty than on some

of the branches, but with more than on some others. The Central Farm is a happy medium in this regard. You cannot, of course, see at this time of year the work we are doing in crop production, but you can examine the live stock work, and discuss all our lines of experiment with our various officers. I cannot allow each of our officers as much time as I should like as our time together has such definite limits, but if I find that to finish as now planned it will be necessary to leave out questions which should be discussed, possibly we may extend the time another day.

(4) I hope you will profit by the work done and the experience gained at the other Farms. I do not know how closely you read each other's reports, but I think you would find it to your advantage to look into them more closely. You now have an opportunity of meeting each other personally, and, if you see a man you like, look up his report and find out what he did last year. (Laughter.)

(5) Plan your work for the future. What you have done, you have done—sometimes well, sometimes ill. Much has been left undone. Not all has been done that should have been accomplished. You might say that at the Central Farm we have assistants in our Divisions. This is quite true. I am trying to get the same for the branches; I am trying to get one or two, or possibly three, assistants at each branch Farm or Station. I cannot say how soon my ambition will be realized. We shall then be able to do very much more and better work in animal husbandry, field husbandry, horticulture, and all other lines of our work, all the details of which we could not follow closely enough with our present staffs. The only thing we can do just at present is to train our foremen, who, unfortunately, are not always susceptible to training. Do the best you can always. I hope you can all secure, not better foremen, but well-trained foremen,

I want you to discuss with our officers the lines of work possible in your districts, and our officers to talk over with you what they think you might do. No one of us can hope to know what ought to be done as well as the Superintendent himself. on the other hand, we cannot expect the Superintendents to be specialists in all lines and to be able to say exactly what is required on his own or any other farm. I hope you will make

a great effort to do the very best you can under present conditions. I hope these conditions will improve by the obtaining of assistants, as I have already said.

(6) You will have an opportunity of learning of the work done by other branches of the Department of Agriculture, the Veterinary Director General, the Live Stock Commissioner, the Dairy Commissioner, the Fruit Commissioner, the Seed Commissioner, and the Dominion Entomologist. I think I have named them all. Their work all has a bearing on ours, and we are all more or less associated. You will meet them and learn what they are attempting to do for the advancement of agriculture. You will have an opportunity of hearing them to-morrow, Saturday, and Monday, and also of visiting the laboratories of some of them. The Dominion Entomologist has a laboratory and a museum, the Biological laboratory at the Farm here has things worth seeing and the Seed Commissioner's laboratory will prove interesting and useful to all. I am asking you to visit these *en masse*, so that the one showing will do for all. I wish you to get acquainted with these men, however, and would suggest your visiting them two or three at a time, in addition to the inspection in the one body. I hope each of you will leave here knowing something of the work being done by the different branches of the Department of Agriculture. The work of the department, you will readily admit, is centered in the Experimental Farms (applause and laughter); if you do not admit it, I do not want to have you remain here (laughter); but the other branches are doing good work, which I wish you to see.

You will find before you copies of the programme of these meetings. This afternoon from three to four, Dr. Malte will discuss his work with you, and afterwards Mr. Sladen will discuss the work in apiculture. In the morning Dr. Saunders will be with you, followed by Mr. Macoun. I hope you will try to be present sharp on time for each session throughout our conference. At 12.30, lunch will be served, where you will meet our chief officers and some of their assistants. Officers of other branches will discuss their work for some twenty or thirty minutes each. After lunch is over, I shall try to have all of you meet them, so that you will know them personally as well as know of what they are aiming to accomplish.

To-morrow afternoon, Mr. Watson will lead the discussion. He is in charge of the Exhibition Work, started last year, but which we plan to expand this year, or rather next year, as far as fiscal matters are concerned. We shall, I hope, have a larger vote available for the purpose, and hope to accomplish more. I shall speak more of this later on.

From 4 to 5.30 to-morrow, Dr. Shutt will take one section, while I shall take up Field Husbandry with the other. Mr. White, Assistant Field Husbandman, is unfortunately away, I hope only temporarily, and Mr. Graham, who has taken his place for the time being, is not yet quite as familiar with the work as he might be, owing to lack of opportunity.

On Saturday from 9 to 11, Mr. Gussow will be with you, and from 11 to 12.30, Mr. Archibald, who is away at present but will return Saturday morning. At luncheon, two officers from the branches in the city will address you.

Saturday afternoon is a "half-day off" at the Central Farm. I have not asked any officers to meet you for any special discussions, but any of you who desire will have opportunities for a quiet talk with them over your special problems.

On Monday morning, you will go over the poultry plant with Mr. Elford, who will lead the discussion, and will afterward visit the Biological laboratory, where vaccine for the treatment of black-leg and tuberculin are made.

In the afternoon, it is planned to go over the live stock and buildings with Mr. Archibald.

Tuesday morning, from 9 to 10.30 Dr. Shutt will discuss soil moisture problems with the Prairie Superintendents, while I shall take up rotation work with the Eastern and British Columbia Superintendents. The Superintendents will then visit the laboratories of the Dominion Entomologist and the Seed Commissioner, in the city.

The afternoon and evening may be spent to advantage at the Live Stock Show.

There is one other thing I must say. That is, you must be prepared to discuss your side of the question. It was not my idea to hold a "short course" when you were asked to come to Ottawa. I want you to give your views as well as listen to ours. You cannot spend this evening to better advantage than in getting together and discussing the various lines of

your work. You are not yet organized. I do not suggest that you go on strike (laughter), but I wish you to become a unit, not atoms liable to fly off at a tangent at any moment.

On Friday evening, I am asking you to come to my home, where I have asked our staff here and some of the officers from our branches in the city to meet you. There will be nothing formal in the gathering, but we will have a good talk and spend a social hour together.

For Monday evening, I may have some suggestion later on, and perhaps for Saturday evening as well. To-night, get into touch with each other. (A meeting was afterwards arranged for Saturday evening.)

I notice that I have on my list of points that of a question drawer. Perhaps a drawer is hardly necessary, but if any one has a problem on which he wants information for himself or for all, or any proposition to make, I should be very glad if he would put it on paper and place it on my desk. He need not sign it unless he desires, although I think I shall recognize the writing in any case (laughter), but what I mean is, that I want each to regard these meetings as a clearing-house of his difficulties.

Should these conferences prove of value, they may be held every year, and I should like to see them made a permanent annual or biennial affair. They will give an opportunity never before afforded for all our officers and Superintendents to discuss and plan their work. If we can get all the nervous energy which I see in the faces before me working on one line for the advancement of agriculture, if we can get perfect co-operation among our Farms and have them all working towards the same end, we shall do much for agriculture in Canada.

Perhaps some of our other officers have something to say. Dr. Shutt, have you anything you would like to add to what I have said?

Dr. SHUTT: I am glad to welcome my colleagues to this conference, and trust we shall spend a pleasant and a profitable time together, both on this and other occasions of the kind. I remember when I was a young man going to conventions and associations and hurrying from one meeting to another to get facts. I modified this after I found that the greatest benefit was often obtained from meeting men, talking to them in the corridors

and comparing notes with them there along our lines of work. I am not saying anything to minimize the value of special meetings, and would, on the contrary, emphasize everything that has already been said as to their value as a source of information and of inspiration. I hope, however, to see you all outside the meetings, and wish you to feel free to take up any point with me at any time. My greatest regret at the time of our last conference was that I did not have more opportunities of meeting you. Better opportunities are afforded us this year in this regard, owing to the preparation of a programme, which will give facilities to you and to me for discussing matters of mutual interest.

Mr. GRISDALE: Mr. Fairfield is, I believe, our oldest Superintendent. Perhaps he would like to say a word or two?

Mr. FAIRFIELD: I had not thought of saying anything concerning the remarks just made by Mr. Grisdale. I certainly feel that we should receive a great deal of inspiration from these meetings. The longer I am connected with the Experimental Farms, the more I feel the need of the co-ordination referred to and, from the way the programme is arranged, I believe that, although the meeting three years ago was very useful, the present one will be still more so.

Mr. GRISDALE: Last time we were called together for other reasons. It was then the desire of the Minister, soon after coming into office, to meet the Superintendents personally.

Mr. FAIRFIELD: Mr. Hutton suggests that the Superintendents meet this evening at 8.30 in the Chateau, in the rotunda.

Mr. GRISDALE: At 8.30 in the Chateau rotunda, then.

Mr. GRISDALE: Mr. Macoun, perhaps you have a few words to say.

Mr. MACOUN: Mr. Chairman and Superintendents,—I am glad to see you all together. I have often been entertained by you while at the branch Farms, and I hope that while you are in Ottawa you will come over and see us. Outside of the one and one-half hours during which we are to discuss horticultural matters, I am at your service at any time, and wish you to feel free to come to me either in my office or at my house and talk over our horticultural work. You have an opportunity to see what we are doing here in the way of finding winter work for the men, which may be of assistance in keeping your

gardeners employed during this time of year. You will also find much of interest in our new greenhouses, as I have no doubt you are all looking forward to the erection of greenhouses on the farms under your charge. (Laughter.)

Mr. GRISDALE: You are giving them bad ideas. You are making a mistake.

Mr. MACOUN: Our greenhouses are, of course, not elaborate. (Laughter.)

Mr. GRISDALE: Oh, no! They only cost ten dollars or so. If they are your commencement of greenhouses, I see your finish. (Laughter.)

Dr. C. E. SAUNDERS: We shall discuss the cereal work in the morning. I can only repeat what Mr. Macoun has said, that I shall be pleased to see you, either in my office or at my house, at any time.

Mr. GRISDALE: Mr. Güssow.

Mr. GÜSSOW: I think that everything which should be said on an occasion like this has been already said and there is nothing left for me to add, more than that I shall be very glad to see you either here or at my house. I am not fortunate enough to have a house on the Farm, however. You will note that I have only one hour on the programme for discussion with you. This modesty was assigned me by Mr. Grisdale. (Laughter.)

Mr. GRISDALE: You only asked for half an hour. (Laughter).

Mr. GÜSSOW. I am sure you will all agree as to the value of a knowledge of the diseases of plants, which will enable you to recognize these troubles when they appear in your crops.

Mr. GRISDALE: Dr. Malte.

Dr. MALTE: In view of what has already been said, I can only repeat that you are welcome. Unfortunately I am not in a position to show my good will as well as some of the others, inasmuch as I have not yet been successful in getting a wife; but if I cannot ask you to come to my house, I can meet you some other place. (Laughter.)

Mr. GRISDALE: I think that I have said all I have to say at this time. It is already a few minutes past three, and I do not wish to break my own regulation. I am leaving you to the tender mercies of Dr. Malte and, later, of Mr. Sladen. I expect to drop in to these meetings as much as I can, as there

will be many cases where the officers will discuss matters of policy and I feel it will be better for me to be present or one of them will be planning to take half the area of one of the Farms for his work !

Thursday, January 14—Session 3 to 4 p.m.

FORAGE PLANTS.—DR. MALTE.

Dr. MALTE: I should like to bring before you and discuss with you a few lines of work which I think could and should be taken up by the Experimental Farms and Stations all over Canada as soon as possible. One of the subjects that I should like to hear your opinions on is the possibility and advisability of producing in Canada all the seed of forage plants needed in our country.

On account of the situation in Europe, you know that we are in danger of having our supply of root seeds cut off or at any rate diminished considerably. Steps have already been taken to grow roots for seed at the eastern Experimental Farms and Stations, but so far no steps have been taken by the Experimental Farms to secure root seed from elsewhere in Canada. I am informed through the Seed Commissioner that his officers have taken up the question and are inducing many farmers all over the Dominion to take up growing of field roots for seed. The Experimental Farms, to my mind, should in this connection act in an advisory capacity, that is to say they should be able to furnish data as to the methods of handling the seed crop and should be able to give all information on the subject to prospective growers.

I feel confident that the time will come, and I hope it will come soon, when Canada will raise not only what is needed in this country of seed of beets, mangels, turnips, and carrots, but also of all grasses and leguminous forage plants necessary for successful and profitable farming.

As you know, we have no actual data bearing on the raising of seed of forage plants in Canada. If, however, we want to see the country's supply of this seed produced at home, we must be in a position to guide the seed growers in advising them how to grow seed of the various forage plants, and also to tell

them which provinces or districts are particularly suited for the different kinds.

I should like to hear from the Superintendents of the Farms and Stations their opinion as to the advisability of starting next year a series of experiments with a view of securing reliable data as to the possibility of seed growing and also with a view of making Canadian farmers interested in our seed-growing possibilities. I should be glad if the Superintendents would give me their ideas as to whether such a scheme would be advisable, and what kinds of forage plant could be and should be grown for seed in the various districts.

Mr. BLAIR: I have made a large distribution of roots at Kentville to farmers throughout the section and hope to learn if it is possible to grow seed with profit. I judge it is not possible to grow on one farm many varieties of these roots unless covered with cheese cloth, but think that, even should it be advisable to grow only one variety on a farm, seed growing should be encouraged as far as possible.

Mr. CLARK: In the province of Prince Edward Island should be grown a great many root seeds. In fact, 125 bushels of mangels have been stored for this purpose, and turnip and carrot seed could also be grown with success to be used among the farmers. The speaker has just completed a course of meetings encouraging them to become interested in the work and spread the information to others.

Dr. MALTE: None of the western Farms has so far been asked to raise root seed, but I should like to have the Superintendents' opinion on the possibility of making a start.

Mr. MCKILLICAN: I should be inclined to advise the increase of vegetable seed growing in the East to be offered for sale to the western markets. Western farmers would be glad to buy seed grown in the East, as other lines of work are of more importance to them than vegetable seed growing. Root seed can be successfully grown, but labour is difficult to get at a reasonable price, and root seed growing needs much manual labour. The quantity of seed wanted by an individual is not large, and the farmer would rather buy than grow it himself.

Mr. FAIRFIELD: The question of raising clover and grass seed is more important to us than the raising of root seed. Alfalfa growing in Alberta has passed the experimental stage, and much of

a pure strain is grown under non-irrigation for sale at the present time. Alsike and red clover might also be grown successfully.

Mr. PARHAM: I think it is quite possible to grow sainfoin in British Columbia. It has been grown in the Okanagan valley, and is one of the best plants for bees. It suffers less from prolonged drought than alfalfa.

At Invermere we have found that we do not always obtain good results when imported seed is used. Seed raised in the Okanagan valley has given most satisfactory results.

Dr. MALTE: Is this, in your opinion, an indication that home-grown seed is preferable to imported seed?

Mr. PARHAM: I think so.

Mr. HUTTON: Grass seed can be grown to good advantage with us, and has already been profitably grown. Under Dr. Malte's direction, work has been done with timothy varieties with good results. Different districts are, however, adapted to different varieties. Alfalfa is about to become a general crop in Alberta, and we have so far looked to southern Alberta for our seed; but two years' growing has not proven alfalfa to be a paying crop with us. I believe, however, it would be, if local-grown seed were used, because this is likely to prove more hardy.

Root and grass seed could be grown successfully if time could be devoted to it, yet what may prove a success in one district may be a complete failure in another part of the same province.

Mr. LANGELIER: The question is not so much whether it will be possible to grow seed of various forage plants in different districts, but whether it will pay the farmers to do so. Labour must necessarily be considered.

Dr. MALTE: The point is well taken. When I brought up the question of starting experiments with seed growing of forage plants, I had in mind to plan and direct those experiments in such a way that the results should not only indicate the mere possibility of growing the seed, but also give a fairly accurate idea of the cost of production.

So far we have no reliable data giving, for instance, the relation of the cost of production to the price paid for the seed of turnips now grown in Nova Scotia. One object of the experiments proposed would be to clear this point.

Mr. BLAIR: Experiments have been tried in Yarmouth, N.S., showing that turnip seed can be grown profitably in that district. May I ask Dr. Malte for some details?

Dr. MALTE: Farmers in Nova Scotia prefer to grow turnips from home-grown seed. Corning's Lapland is a favourite variety. The price is about 30 to 35 cents per pound. Fields have been seen that yielded 1,800 pounds to the acre. At present, however, farmers do not grow acre lots of seed, but only smaller plots, and consequently get a comparatively small amount of money for their seed. Grown on a large scale for wholesale dealers, the price would be about 10 cents per pound. As the Seed Branch, however, pays a subvention of 4 cents per pound, the price realized by the growers is about 14 cents. With a crop of, say, 1,000 pounds to the acre, the gross returns would amount to $140 per acre. From this has, however, to be deducted the cost of production, including, among other things, labour and rent of land. What these items amount to would be one of the objects of our experiments, but I feel confident that high though they may be, there will be left a handsome income to the producer.

In conclusion, I would ask each of you to furnish me with a brief memorandum giving names of varieties of grasses, clovers, and field roots which, according to your opinion, should be tried for seed growing in your respective districts.

There is another experiment, or rather, series of experiments which I should like to discuss with you. You are well aware that in many parts of Canada farmers cut their hay much too late. They often wait until it becomes dead ripe, and thus harvest a hay which is inferior not only as to palatability, but also as to feeding value. As you know, it is very often extremely difficult to convince farmers that the actual feeding value of hay cut at blossoming time is greater than that of hay cut weeks thereafter, even should the late cutting give a larger tonnage. What we need, in order to convince farmers of the advisability of early cutting, is actual data showing the value of hay harvested at the proper stage of development and of hay harvested too late.

I should like to hear your opinion on the advisability of starting such experiments.

Mr. Munro: Although, at present, farmers in my district do not grow " tame " hay, I think it would be advisable to have such data ready for the time when growing of, for instance, Western Rye grass is taken up by the farmers of the district.

Mr. Tinline: I thoroughly agree with Mr. Munro.

Mr. Baird: Farmers in Nova Scotia generally cut their hay much too late, both on marsh land and upland. If we could prove to farmers, by actual figures, that they lose money by leaving their hay too long, it would certainly be a good thing.

Mr. McKillican: We could do good work with grasses and alfalfa. I should like to hear, however, more in detail how the experiments would be carried out.

Dr. Malte: The feeding value of hay depends, among other things, on two factors, viz., quantity and quality—that is yield and chemical composition. The aim of the experiments would therefore be to ascertain at what stage of development the value of the hay, determined not only by its tonnage, but also by its chemical composition, is the greatest. In order to accomplish this, the grasses or clovers used for the experiments should be cut at different times, say, when in bloom, when half ripe, and when dead ripe, and the yield to the acre of the different cuttings be recorded. Samples from each cutting should then be analyzed chemically and the actual feeding value be computed from the tonnage and the chemical composition.

Mr. Hutton: Chemical analysis may be all right, but sometimes it does not agree with the actual feeding value as determined by the increase in milk or flesh production. I would therefore suggest that feeding experiments be undertaken in conjunction with chemical experiments.

Dr. Malte: Whether feeding experiments should be undertaken or not depends largely on the amount of land available at each Station. If feeding experiments be made in preference to or in conjunction with chemical analysis, it would be necessary to allot acres to the experiment, whereas, if chemical analysis only be taken, small plots would be sufficient.

Mr. Clark: Certain Farms could base the feeding value of hay cut at different times on feeding experiments; others who are more cramped for land, could trust to the chemical analysis.

DR. MALTE: I understand that you all agree that experiments of the kind just discussed would serve a good purpose, but that you have different opinions on the question how the feeding value could be best determined. I think that Mr. Clark's suggestion is a very good one, and that the value of the experiments would be increased if feeding experiments could be added to chemical analysis for the determination of the real value of the hay.

I would ask each of you to prepare a brief memorandum on the subject, suggesting:—

(1) Which forage plants could, to greatest advantage, be used for the experiments just discussed.

(2) Whether feeding experiments, or chemical analysis, or both, should be made for the determination of the feeding value of the hay on your respective Farms.

MR. CLARK: We have discussed the advisability of starting two new experiments with forage plants. To my mind, the taking up of two entirely new lines of work would mean too much additional work for the Superintendent. I beg to suggest that the new experiments be divided on the different Farms, some Farms taking up the first experiment, and other Farms the second one.

DR. MALTE: Mr. Clark is just striking a point which I had intended to take up with you before the end of this conference.

I think that the thoroughness and reliability of the comparative tests with forage plants which are at present carried out at the Farms and Stations could be somewhat increased. I do not mean by this that the plot work is being wilfully neglected by the Superintendents. I know you have your hands full during the growing season, and that you pay as much attention to the variety tests as you possibly can, and when I propose new experiments I feel that I am asking you to take an extra burden upon your shoulders.

For the successful carrying out of variety tests, I think there is needed at each Station a special man of about the same standing as that of the gardener. That is to say, an intelligent man whose duty would be to look after the experimental plots during the whole season and from year to year.

Dr. Saunders: There are, to my mind, two limiting factors, which to a great extent hamper the experimental work with cereals, namely, lack of land and the fact that the Superintendents are overburdened. The result is that work with cereals is more or less neglected. I would therefore strongly recommend that there be appointed, at each Farm, a man of the type just suggested by Dr. Malte. I think, also, that one man would prove sufficient for looking after the experiments with both cereals and forage plants.

Mr. Clark: One intelligent man could look after the work in cereals and forage crops; also take notes and help with the manual labour. In taking notes he might be assisted by the Superintendent from time to time in order that it would be thoroughly and efficiently done.

Thursday, January 14th.—Session 4 to 5.30 p.m.

BEE-KEEPING.—MR. SLADEN.

Mr. Sladen: The importance of bee-keeping is not sufficiently recognized. Not only for honey crops are bees valuable but also for pollenizing fruit bloom, alsike, and other farm and garden crops. Not the least of its benefits is that it helps to keep the farmers' sons from drifting into the cities. There is plenty of excitement and money in the stings and honey from bees! There is hardly a region in Canada where bees can not be made to pay. Lethbridge Experimental Farm is in one of the least promising looking districts for bees because here high winds and dry weather prevail, but this year one of Mr. Fairfield's colonies yielded 100 pounds of honey, which would be considered good in the best regions. The principal objects of bee work at the branch Experimental Farms, it seems to me, are to find out the possibilities of bee-keeping, the quantity, quality, and sources of honey, in the region served by the Farm, and to demonstrate to visitors how bees should be kept. There is also the supply of honey and live bees needed for exhibition purposes. An observation hive is being sent to each Farm for exhibiting live bees. At several of the exhibitions last year live bees proved the chief attraction.

Ten or fifteen well-managed colonies are enough for an apiary for all these purposes. Bees can be kept successfully on all the branch Farms, if the bee-man looks after them properly. Regular, intelligent examination of the colonies to see that they are maintained in good condition is important.

Mr. GRISDALE: What is the average number of hives kept on the various Farms?

Mr. SLADEN: It varies from two at Indian Head to forty-four at Ste. Anne de la Pocatière.

Mr. GRISDALE: How many Farms do not keep bees?

Mr. SLADEN: Two, Scott and Rosthern.

In visiting the Farms last summer, I found swarming to be the cause of more loss in bee-keeping than anything else. It checks or stops honey production. To discourage swarming, the hive entrance should be enlarged and the super put on as soon as the bees fill the hive. Never let the hive get overcrowded. Ten combs are needed for breeding; therefore a ten-frame hive is the best to use. Work for extracted honey, and use a queen excluder. Keep the hive cool by shading from the direct rays of the sun. Clipping the queen's wings in April to prevent the first swarm getting away is a good thing. When the swarm is coming out the queen may be found in the grass in front of the hive. She should be put in a new hive, placed on the old stand, and the old hive moved to a new stand. The swarm will return to the queen in the new hive, and the old colony, having lost its field bees, will probably not swarm again. To watch for swarms, the bee man or somebody should be working or present within 100 feet of the apiary between 8 a.m. and 2 p.m., on every fine day during the swarming season, which lasts about four weeks in June or July. At Indian Head the apiary is in view of the office window.

A SUPERINTENDENT: Will a queen go far away from the hive if her wings are clipped?

Mr. SLADEN: One or two yards.

A SUPERINTENDENT: Is it necessary to feed the swarm?

Mr. SLADEN: Only if three or more consecutive days of bad enough weather to prevent honey gathering follow.

There are always a few non-swarming colonies in an apiary that swarms badly, and experiments are being made to ascertain whether the non-swarming character of such colonies is inherited;

if so, we my be able to get bees that are disinclined to swarm.

Mr. GRISDALE: Would you experiment with methods of preventing swarming?

Mr. SLADEN: It is done a good deal in Ontario; but I think our best policy is to select only the best methods, and test them under the various conditions found on the different branch Farms.

A SUPERINTENDENT: If no swarming takes place and you wish to increase the number of colonies by division, what would be the details of procedure?

Mr. SLADEN: Wait until the bees fill the hive, but not later than mid-July; then take the queen and a frame of brood and put them in a new hive, and put that hive on the old stand. A queen or queen-cell may be given to the old colony. Too much dividing has been done on some of the Farms, with the result that the bees got weak and died. Two strong colonies are better than four weak ones.

Mr. GRISDALE: How many colonies have you at Lethbridge?

Mr. FAIRFIELD: Two.

Mr. GRISDALE: How many at Lacombe?

Mr. HUTTON: Three.

Mr. GRISDALE: How many at Brandon?

Mr. MCKILLICAN: About twenty.

Mr. GRISDALE: How far will bees go for food?

Mr. SLADEN: They will gather surplus up to a distance of from $1\frac{1}{2}$ to 2 miles. The distance is less in windy weather. Bees have been known to travel 6 miles in search of food if there is none nearer. Alfalfa is the chief honey plant at Lethbridge. A useful experiment to carry out would be to draw on the local map a circle 3 miles in diameter, with its centre the apiary, and then ascertain what acreage of alfalfa there is in bloom within this circle each week in the season and note its effect on the weight of a hive kept on scales. This would be a good experiment to make on all the branch Farms with all the important honey plants.

We want also to investigate the source of a resinous flavor that occurs in some honeys. Another subject for experiment is wintering. The region in which outdoor wintering proves more satisfactory than cellar wintering is extending, but few bee cellars are properly constructed.

Useful work can be done in comparing the Italian and the Black bee. The Italian bee seems better adapted for inland regions, and the Black bee for the coasts. Where the climate is severe, the three-banded Italian is likely to be the best kind of Italian, but bee-keepers should be advised to get bees from their own locality to prevent the spread of bee disease. Colonies may be Italianized by purchasing queens.

Mr. GRISDALE: I think we should decide on certain lines of work and follow them with some object in view. Wintering, for example, is a small matter, but an important one. Studying flowers for bee pasture, testing varieties of bees, etc., are all important.

A SUPERINTENDENT: How about feeding bees; should it be done?

Mr. SLADEN: Stimulative feeding is desirable during the dearth of honey that frequently follows fruit bloom. Feeding is also necessary during a long spell of bad weather if the bees are in danger of using up their stores. Autumn feeding to bring bees up to the required weight for wintering is important.

I should like to have your opinion on the apiary report blanks that I recently sent to be filled out. One of the main reasons in asking so many questions on these forms is to draw the apiarist's attention to the things that most require to be done.

(The blanks were generally approved of with the exception of the daily weather report which, it was pointed out by the Director, nearly duplicated the more careful report made for the Dominion Weather Service.)

MR. SLADEN: An important question is the form in which the honey should be produced. I would suggest that the best rule to follow is to work all the colonies in each apiary for extracted honey with the exception of one or two supers of comb honey for exhibition purposes, etc. Comb honey is not easy to raise, and it makes the swarming problem harder.

MR. GRISDALE: The proportion of each kind of honey might be made a subject for experiment at each Farm.

MR. SLADEN: The bee-keeping conditions on the Experimental Farms are somewhat special, in the way of extensive shelter from wind in spring, extensive cultivation, and absence of wild flowers and the presence of special flowers. Thus

they do not quite accurately represent the conditions found in the districts served by the Farm, especially on the prairie. The question of a small out-apiary, say two or three colonies, in a more representative spot within convenient reach of the Farm should be considered. These colonies would be wintered at the Farm.

Mr. Grisdale: How would you prevent swarming in an out-apiary?

Mr. Sladen: By cutting out the queen cells every week in the swarming season. It is too much trouble to do this in large apiaries.

A Superintendent: Could you get local-bee-keepers to co-operate in bee experiments?

Mr. Sladen: This is an excellent suggestion. Bee-keepers in the bush and elsewhere have supplied me with valuable data that could not possibly have been collected on the Experimental Farms.

Let me say in conclusion that a well-managed apiary is the foundation of successful bee work. Without it we cannot profitably study any of the problems we have been discussing. The success of an apiary depends much upon a proper overhauling of the bees in September, seeing that each colony is strong and has a fertile queen and sufficient stores to last till May or June. A circular letter on this subject was sent to each branch Farm last August. In future, general notes on seasonable apiary work will be given in "Seasonable Hints," the new quarterly of the Experimental Farms Branch.

(At the Conference on Poultry held on Monday it was estimated by Mr. Sladen that six hours a week would be needed for bee work in April and October, eight hours a week in May and September, and twelve hours a week in June, July, and August, not including watching for swarms. From November to March, two to four hours a week might be spent.)

Friday, January 15th.—Session 9 to 11 a.m.

CEREALS.—DR. SAUNDERS.

DR. SAUNDERS: We shall take up two principal subjects, the sale and distribution of seed grain, and the experimental plot system.

I think it would be well, especially for the sake of those Superintendents who have not been connected with the system very long, to make rather full explanations in regard to the distribution of grain, and if in making these explanations I seem to the older Superintendents to be giving unnecessary information, I hope they will pardon me.

I am anxious that the manner in which the distribution from Ottawa is conducted should be thoroughly understood by everyone, and also that there should be uniformity in regard to the management of the distribution of potatoes from the branch Farms; and it is particularly important that there should be some recognized system in the case of those provinces, such as Nova Scotia, Saskatchewan, Alberta, and British Columbia, where there are two or three Stations in the one province.

The objects of the distribution, as you know, are to provide the farmers with seed of better quality than they could otherwise obtain, or of new varieties which are not yet obtainable in commerce.

Our system of keeping records has been well developed, and I think the same system might be used to advantage on those branch Farms from which a distribution of potatoes is conducted. We use large loose-leaf books, and we classify the applications by post offices. This classification by post offices is advantageous in several ways, but particularly in revealing, as a rule, any fraudulent attempt to obtain samples, which might escape detection if the names of applicants were entered in alphabetical order. Every application that is accepted is recorded in these books. In years gone by we sometimes received from certain towns and villages a number of applications altogether disproportionate to the population or to the probable number of interested farmers in the locality. That was the principal reason why we introduced the system of

keeping the records according to post offices. The present system works well, but is not perfect. A few days ago I detected an extraordinary attempt at deception. From Trochu and from Huxley (two post offices close together, in Alberta) a man wrote asking for samples. He used one sheet of paper and tore it in two, and sent in the two pieces by the same mail. I wrote to him as follows: "I have received an application from you from Huxley post office for a sample of wheat. I have received another from Trochu. This is a most unusual proceeding and will require considerable explanation before any sample can be sent." He replied: "I can't help it if there is a man in Trochu with the same name. I wish you would send me the sample." I wrote again, saying: "I would call your attention to the fact that not only is the name the same in the two applications in question, but the hand-writing is identical, and they are both written on torn pieces of paper, the torn edges of which match exactly. Under the circumstances I cannot send you any sample."

When an application is received, if it exhibits a reasonable amount of intelligence, and gives some explanation of the conditions on the applicant's farm (in other words, if it complies in a fair sense with the regulations laid down), the application is accepted, either for the variety for which the man asks, or, in a good many cases, for another variety which I think more suitable for his conditions. No doubt you have all noticed that there is a tendency to apply for varieties with high-sounding names. For instance, a man will apply for Gold Coin potatoes and Gold Rain oats. In applications of that kind, I seldom send the variety asked for, as it is very often not the sort most likely to succeed.

When an application is accepted, it goes to the distribution room, and the record books are inspected to see if the applicant received anything last year, or even within two or three years, and if he has not replied, giving us a report on his last plot, I inform him that I regret to learn from the records that he has not yet reported on the last sample, and that as full a report as possible must be sent to me if he wishes to be eligible for any further samples. As long as he is on the books as not having reported, he cannot receive anything. A man wrote to me recently saying the farmers in his district do not think it worth

while to report. We want to convince them that it is worth while.

We reply by circulars as far as possible. Possibly at some of the branch Farms you might save a good deal of work by having more printed circulars on hand than you now possess. (It is only necessary to send in the manuscript from three to six months ahead in order to have them printed by the time you require them.) Last year we sent out 28,000 printed circulars, including about 9,000 report forms. This means a saving of 19,000 type-written letters—a very large amount of work. We use altogether about a dozen circulars (each being printed in both French and English).

You may be interested in hearing some of the results of the distribution, as shown by the percentage of reports received. Accurate records dating back several years are not available; but it appears that we received reports on about 12 per cent of the samples sent out. Of these reports the majority were absolutely useless.

In 1912, when we began to make the regulations more severe, the distribution dropped from about 34,000 to about 13,000, because we insisted on each applicant giving some explanation of the conditions on his farm and his previous experiences. Sometimes applicants became annoyed, but such annoyance was unavoidable. One man wrote: "It seems impossible to obtain anything but paper from your office." He alluded, of course, to the printed circulars.

We classify all reports on plots into three groups:—

(1) Those which show thought and care and which may therefore be of use to us. These we classify and study with a view to obtaining all possible information from them.

(2) Those which comply moderately well with the conditions, but do not give enough information to be of use to us.

(3) Those which are so poor that they cannot be accepted as reports at all.

The reports are acknowledged by suitable circulars. The acceptable reports are acknowledged with thanks, and the farmers whose reports are very careless and incomplete are informed as delicately as possible that, not having complied with the regulations, they are not eligible to receive any further samples.

For the season of 1912 we had 25 per cent of replies from the whole of Canada. Ontario stood first with 31 per cent of replies and only 1 per cent rejected. Manitoba and Alberta came very close to Ontario with a percentage of 29. British Columbia had 27, Saskatchewan and Prince Edward Island 25, New Brunswick 21, Nova Scotia 20, and Quebec 19 per cent. Both Quebec and Nova Scotia sent less than 7 per cent of useful reports.

The figures for 1913 show considerable improvement. The total replies are approximately 34 per cent. The provinces stand in nearly the same order, with the exception of British Columbia, which is lower than the previous year. The provinces east of Ontario are all rather low on the list. I may say that the lack of intelligence displayed in the average application received from the eastern provinces is very striking. Leaving out those foreigners who have little or no knowledge of English, applications from the western provinces are of decidedly superior quality.

Q.—Does it seem to be a lack of intelligence or merely a deficiency in elementary education that causes the farmers in the eastern provinces to send in such poor applications?

Dr. SAUNDERS: I think it is due to both causes. Occasionally a badly-written, ill-spelled letter displays considerable intelligence, but such cases are exceptional.

A SUPERINTENDENT: I should like to point out in regard to eastern conditions, that the farmers down there secure their seed usually in lots of from 1 to 20 bushels, and buy their seed. Our better farmers are scarcely touched by the distribution.

DR. SAUNDERS: I think that the grain distribution affects chiefly the very poor farmer and the very good farmer, but I fear that the average farmer does not make much use of it. The average farmer is able to succeed fairly well without the assistance of the Experimental Farms, and very often fails to realize (what the best farmers know well) that with the assistance of the Experimental Farms he could succeed even better. On the other hand, the poorer class of farmer applies for Government assistance chiefly because it is to be had free of charge. Of course it usually does him very little good.

Q. Is the distribution of potatoes carried on in the same way as that of grain?

DR. SAUNDERS: Yes, essentially the same, but there is one point of difference. It is commonly believed that a variety of potatoes may run out, and it is known that a change of seed in potatoes is often a very good thing, whereas in regard to grain there is no good reason for a change of seed if a farmer handles his grain properly. We have a rule not to supply the same variety of grain a second time to the same farmer except in case of a crop failure. In potatoes we do not keep to this rule.

CLEAN SEED GRAIN.

I want to point out to those Superintendents who grow grain for sale as seed or for the free distribution from Ottawa, that certain problems in grain cleaning are comparatively easy in the field, but almost impossible afterwards. I refer particularly to the elimination of a very small proportion of barley from oats. I remember seeing at one of the Farms a field of oats which had probably about 100 plants of barley to the acre. At the time I saw the field, the barley was as tall as the oats, and the barley awns caught the light in such a way as to be very conspicuous. Standing at one point I could see pretty nearly every barley plant in the whole 2-acre field. It was a very simple and inexpensive matter to pull out all the barley plants at that time. After the oats are full grown, it is very difficult to find the barley plants, and if the problem of eliminating the barley is postponed until after the grain is threshed, it involves hand-picking at a cost of about $1.50 a bushel. It is therefore important that the grain should be purified in the field. With our new grain-cleaning machine we are not much troubled by wheat in oats, or oats in wheat. But oats in barley and barley in oats, and some mixtures of wheat and barley are difficult or even impossible of separation.

I hope no one will neglect to rogue the fields of grain for seed purposes.

I should also be glad if the Superintendents who have grain for sale would adopt the practice, as Mr. McKillican has done, of having a printed anouncement made in regard to the quantities available and the prices to be charged. It would also be well if you would notify me when your stock of seed of any variety is exhausted.

Q. Are we allowed to put any notice of seed grain for sale in a local paper?

DR. SAUNDERS: I do not think there would be any objection, as long as it is inserted as an item of news, and not as a paid advertisement. A paid advertisement would have to be authorized by the Director.

SMUT.

Years ago the farmers used to think that the seed supplied from our Farms would of course be free from smut, and I have had some complaints from farmers who found smut in the crop raised from our seed. One farmer even claimed that smut was unknown on his farm except in his small plot grown from our seed. While I was convinced from the style of his letter that his statements were not correct, I congratulated him on having such a remarkable record and explained how he might prevent the spread of smut from his plot. In order to avoid any just, adverse criticism we now send out to each farmer receiving a sample, a printed slip stating that our seed is not guaranteed entirely free from smut, and giving directions for treatment, if he wishes to treat the seed.

Q. What instructions do you give in regard to the treatment of smut in barley?

A. The small printed slip gives directions for the treatment for bunt, for both of the oat smuts and for the covered smut of barley. The loose smut of wheat and loose smut of barley are not mentioned because the treatment for these is rather too difficult for farmers.

Q. Does the average farmer know the distinction between the covered and the loose smut of barley?

A. Probably not. This little slip is not intended to cover the subject thoroughly, and does not include the hot-water treatment. When we receive a special inquiry about smuts we send a larger printed circular giving full instructions, but with the samples we send the instructions for the formaldehyde treatment only.

The printed slip and the circular in regard to smut could be furnished (in quantity) to any of the branch Farms, if desired; but of course I could not promise immediate delivery of anything which has to be printed.

DISTRIBUTION OF POTATOES.

I think it is very important that our potato distribution should, as soon as possible, include only selected strains. We are looking forward to this at Ottawa, and the same system should certainly be adopted at the branch Farms. The success of our distribution depends on two things: That we should send out seed (whether grain or potatoes) superior to that which the farmers can buy, or else that we should send out varieties not generally purchasable. If the seed we furnish has neither of these merits we are only competing with the seedsmen, and are doing very little good.

Q. Do you have your potato samples treated before being sent out?

A. No. We select our potatoes carefully, so as to have them as nearly as possible free from disease; but it has been thought unwise to treat them with any poisonous chemicals before sending them out.

Q. How do you hand-pick a bushel of oats for $1.50?

A. Our regular men are able to hand-pick oats at a cost of about 75c. a bushel, but we are usually obliged to have them done twice. It is very hard work for the eyes. Wheat costs less than 1c. a lb. to hand pick. The grain is, of course, carefully cleaned by machinery first of all.

Q. Have you compared the merits of the different fanning mills? What is the best?

Dr. SAUNDERS: We have tried several. The best we have is an old one, and we are now having it rebuilt. It has an exceptionally large fan. I have lately taken up with the Wm. Gray Sons-Campbell Company, of Chatham, Ont., the question of fanning-mills. I think we shall probably test one of their latest models against our new French grain-cleaning machine. The Ontario firm seems very anxious to build a mill that will do first-class work, and are willing to take suggestions as to possible improvements.

Q. Have you tried the Clipper?

Dr. SAUNDERS: Not in my Division, but there is a very small one in use in the Division of Forage Plants. The Clipper is deficient in the number of sieves.

Q. Have you tried the Emerson to separate oats and barley?

Dr. SAUNDERS: No. I have seen the Emerson, but have never used it. It did not impress me very favourably. The Emerson I saw was designed primarily for separating oats from wheat. For that purpose I think it is inferior to the Richardson or the French machine which we have.

I might explain that both the Richardson and French machine have pockets into which the seeds will fall if they are not too long. These pockets separate the grain by maximum diameter. Ordinary sieves separate essentially by minimum diameter. Oats and vetches for instance, have about the same minimum diameter and are very difficult to separate by sieves; but by the pockets the separation is easily made. Similarly, wild buckwheat can easily be removed by the pockets from almost any sample of wheat, oats, or barley. The French machine has sieves as well as pockets. By having both methods of separation in the one machine there is a considerable gain.

A SUPERINTENDENT: The principle of the Clipper is two-fold: it separates by sieves and by wind power also.

Dr. SAUNDERS: The French machine separates by wind also, but no better, I think, than a good fanning-mill.

I am very anxious to be able to recommend a fanning-mill, but I am sorry to say I have not yet become acquainted with any fanning-mill that will do really satisfactory work. The Wm. Gray Sons-Campbell Company sent me a sample of their separation of barley from wheat. They said it was not perfect, but could be much improved by being repeated. I replied that the standard of purity we have set for our seed grain is one weed seed in 10 lbs. of grain, and one kernel of a foreign cereal in 5 pounds. The sample of wheat they had cleaned still contained foreign seeds at the rate of 450 kernels of barley and 30 weed seeds for every 5 pounds of wheat. Such cleaning would, of course, be quite useless for our purpose.

In this connection let me point out that ordinary inspection of seed is almost useless when one wishes to determine its purity. I make it a rule to have at least 4 pounds thoroughly hand picked (regardless of the time it takes). The results of this test are then reported to me before any of the seed is bagged for distribution. When grain does not come up to the required standard it is re-cleaned or hand picked.

I am sorry to say after having studied it carefully for several years I have been forced to the conclusion that the single-plot system is nearly useless for the accurate determinations of relative yields. We must abandon it in every case where it is possible to do so. On this Farm we have not land enough to put in the varieties once each year, so of course the duplicate-plot system is out of the question, but I am going to make some changes this spring and adopt a system which will be an improvement on the former single plots. On the branch Farms I am anxious to have either duplicate plots or what I may call the check-plot system.

The check-plot system requires less land than the system of duplicate plots, but has an objection from the point of view of the public, in that it leads to the publication of corrected and not actual yields. In this system we take one variety as a standard or check, and sow it on every fifth, tenth, or twentieth plot—according to circumstances. A map of the field is made and the plots are grouped around the check plots, according to their nearness or, when the soil is very variable, according to the character of the soil. The object is to have one check plot which shall be typical, so far as yield is concerned, of each group. The average yield of all the check plots is taken, and when, for instance, a check plot has given less than the average yield, a corresponding addition is made to the yield of each plot in that group, or if the check plot is above the average a proportionate reduction is made.

The DIRECTOR: Is it advisable to publish the yields obtained from the single-plot system?

Dr. SAUNDERS: On uniform land they are certainly valuable though the public usually overestimates the value of the figures for any one season. But I do not think we should be justified on that account in keeping the figures from the public. By the adoption of either the duplicate or the check-plot system we shall certainly have much more trustworthy results.

Q. Will the results be quite accurate if you take it for granted that the inequalities in the soil have affected all the varieties in exactly the same way as they have affected the variety used for the check?

Dr. SAUNDERS: I do not think this assumption is perfectly correct, but I think it will be essentially correct in nearly all cases.

Q. Do you think Marquis wheat would retain its high rank among the varieties in Saskatchewan if it were tested on poor soil or on land which was cropped the previous year, instead of on good summer-fallow?

Dr. SAUNDERS: We are starting at Indian Head a series of plots on land cropped the previous year, so as to obtain information on that point. I do not think that Marquis yields relatively quite so well on land cropped the previous year, in dry districts, but the evidence is not yet very conclusive.

A SUPERINTENDENT: I hear a lot about Marquis being harder hit by a light frost than other varieties, but I cannot get sufficient evidence to prove whether this is so or not.

Dr. SAUNDERS: The chief complaint that I have heard about Marquis is that it is too hard to thresh. I recently received a letter from a farmer who wanted a new variety of wheat. He said "Preston shells out too easily in the field, and Marquis, though all right in the field, is too hard to thresh."

A SUPERINTENDENT: The general belief among farmers in Saskatchewan is that Marquis, on land which is not very strong, will not yield as well as Red Fife.

Q. Have you in mind any line of experiments to test out these varieties under adverse conditions?

Dr. SAUNDERS: Not under conditions more adverse than by using land which has been cropped the previous year. It would not be desirable to use bad farming methods in order to produce adverse conditions.

I want to emphasize the very great importance of observations on earliness and on strength of straw. The utmost care should be used to have these observations as accurate as possible, for they are very valuable. When any varieties behave in an abnormal manner, this fact should be indicated when reporting, otherwise the published results may be misleading.

SEED SELECTION.

There is one point in regard to the selection of seed which I wish to emphasize. The famous plant breeding station at Svalöf started out to improve varieties by mass selection,

and then decided after a few years' trial that that method did not work well. Propagating from single plants was then begun, with success. But the old idea of mass selection did not die. It was introduced into Canada some years later, and is still to be found here. It has been very clearly shown that one need not expect to improve pure varieties by mass selection. In dealing with pure varieties, therefore, one should not select exceptional heads from a plot, but typical heads. It is important when talking to farmers not to allow them to suppose that mass selection applied to a pure variety will produce anything new or effect a radical improvement. If one starts with an ordinary, impure commercial variety the case is different. The weight of evidence all goes to show that by selection of heads you cannot, practically, effect any material change in a pure-bred variety. Selection is a dangerous practice, except in the hands of a specialist. I have seen several instances where the selection of the wrong type of head out of an impure variety has ended, after several years, in the almost total elimination of the variety in favour of an undesirable impurity. In ordinary mass selection the object should always be to pick typical heads in order to keep the variety pure. In other words we should select heads to avoid change, not to produce change.

Another point I wish to mention is that, as a rule, it is very undesirable to do anything with the bulk of the crop from a small plot. At Ottawa, where we have a sufficient staff devoting our time to the one problem, we are able to thresh the plots without mixing the varieties in the process. We get our machine clean. At the branch Farms the conditions are sometimes much less favourable, and I think that a certain amount of mixing caused by seed retained in the machine is often unavoidable. The bulk of the seed of the plot should not, as a rule, be sown. The propagation of new varieties on a larger scale will usually be begun with seed supplied for the purpose from Ottawa. All plots must, of course, be carefully rogued, in order that they may present a good appearance. Where practicable, it is often best to save hand-picked heads for the plot seed for the next season.

Q. How about some exceptionally good varieties (such as Old Island two-row barley) that have been propagated in other provinces?

Dr. SAUNDERS: In such cases the Superintendents will, of course, commence propagation from their own seed. I do not wish to hamper in any way the work of the Superintendents, but I always wish to be kept fully informed as to what they are doing in regard to any varieties of grain in which they are particularly interested.

I shall endeavour to send, from time to time, a supply of new seed, if necessary. I am anxious that we should, on every Farm, grow seed which is not surpassed anywhere in the district.

Q. Supposing we have seed which we received from Ottawa and after two or three years it is very much improved over the original, due to acclimatization, would you still send new seed from Ottawa?

A. No. So long as the strain is kept pure, there would be no object in sending new seed.

The DIRECTOR: I wish to refer again to a point which I mentioned yesterday, and to which Dr. Saunders has just alluded, *i.e.*, the development of individuality on the part of the Superintendents. I do not want you to think that we are bringing you here to make you automatons. On the other hand, we want you to be individuals, your Farms to be individual. We want you to think of your work in your own sphere just as much as you have done in the past, if not more; but there are certain things in which we want co-operation. Besides these, we want you to carry on experiments which will be of local interest, of local benefit. We want local patriotism on the Farms and on the part of the Superintendents.

Friday, January 15; Session 11.00 to 12.30.

HORTICULTURE.—MR. MACOUN.

(Discussion of the outline of Proposed Cultural Experiments in Vegetables on Experimental Farms and Stations.)

At the opening of the meeting a copy of the Outline of the Proposed Cultural Experiments (see p. 54) was handed to each of the Superintendents, with the explanation that it was merely an outline of possible experiments and was intended to inspire

them to suggest others, more than anything else. It was thought advisable to take a few of the vegetables and treat each one separately, so as to get some definite information with regard to the cultivation of the different kinds.

Mr. Macoun thought that as varieties had been pretty thoroughly tested, on the older Farms especially, it was desirable now to have more cultural experiments than there had been in the past, and to obtain results which would give the farmer valuable information.

The first vegetable discussed was the onion. "While the onion is not relished by some people, yet we have got to bear in mind that the onion is one of the most important vegetables grown in Canada," said Mr. Macoun. It was thought advisable to start some experiments with fall ploughing *versus* spring ploughing, in order to obtain some definite information as to which was the better way. It was thought that fall ploughing was better in the West, as when the land was ploughed in the fall and not worked deeply in the spring, the onion seed germinated more quickly than if the soil were ploughed in spring, thus loosening the soil too much and causing a delay in the growth, with the effect that the onion did not mature. Mr. Macoun said "a great many people write in to the Horticultural Division asking : 'Is it better to sow onion seed in the fall or in the spring?'" It was thought advisable to carry on a from three- to five-years' test in regard to this. Mr. Macoun suggested three varieties to be used, namely, Early Flat Red, Large Red Wethersfield, Yellow Globe Danvers, for the Prairie provinces, and Large Red Wethersfield, Yellow Globe Danvers, and Prize Taker for the other provinces, the experiment to be based on the following cultural methods: (1) Grown from seed sown in open and thinned to 1, 2, and 3 inches apart; (2) grown from young plants started in the hot-bed and transplanted to open ground; (3) grown from onion sets. During the discussion on whether it was better to grow the onions from seed or from sets, Mr. Macoun suggested that the Superintendents procure a bulletin recently issued by the Illinois Experiment Station, in which they give their results of a five-year experiment in growing onions from sets. They have found that they could get over 100 bushels per acre more by growing them from sets. "While it is more expensive to start with," said Mr. Macoun, "yet it

is better in the end, and it would be well to thoroughly test this. I do not know whether any of the Farms have attempted to grow sets or not, but I think it an experiment well worth while. If it is much more profitable to grow onions from sets, we should have some definite information on the subject. The best method of obtaining sets so far described is the planting of the seed exceedingly thick, say 200 seeds to a foot. An onion set is a prematurely ripened onion which did not attain its proper size, and if it is only one-half inch in diameter it will not, when planted, throw up seed shoots, but will develop into a larger bulb."

Q. Is there anything in having the land very poor?

A. Well, yes, the poorer the land the better, in some cases.

Q. Why not on fertile land?

A. On the richer land you can sow the seed a little thicker. It takes from 80 to 100 pounds per acre at 200 seeds per lineal foot, not square foot. It is just possible that on prairie soil the seed should be sown still thicker. The object is to so crowd the onions that they cannot develop much. They then ripen or dry up during the warm weather and the following spring when planted instead of throwing up seed stalks they develop into larger bulbs.

Q. When is the seed sown?

A. They are sown in spring the same as the others.

Q. Are they left until they die down?

A. Yes.

Q. About what width would the seed be scattered?

A. About an inch wide in the row.

Q. Is the storage of sets more difficult?

A. No more so than onions.

Mr. GRISDALE: Can the sets be produced on the Farms?

A. Yes, it is quite easy to produce them.

TOMATOES.

Mr. MACOUN: There are only a few here who come from parts of Canada where tomatoes can be grown as in the south-eastern part of Ontario. For instance, the people in southeastern Ontario would not, except in special cases, grow tomatoes tied to stakes and confined to one stem. On nearly all of our

Experimental Farms it is rather difficult to ripen tomatoes owing to climatic conditions. The Saskatchewan and Manitoba Farms have found that by training the tomatoes to one stem and raising them off the ground, a larger crop of ripe fruit can be produced than by leaving them on the ground. I have suggested a comparison of the culture of two varieties, Sunnybrook Strain of Earliana, and Chalk's Early Jewel, as follows: (1) Different methods of starting plants according to conveniences of individual Farms; (2) allowed to grow unpruned and left lying on the ground; (3) pruned to one stem; (4) pruned to two stems, and, besides, (a) tied to stakes, (b) tied to wire, (c) removing a certain proportion of foliage, (d) not removing any foliage; and (5) methods of ripening green or partly ripe fruit.

On some of the branch Farms visited, I found that nearly all of the foliage was taken from the plant in order to get them to ripen. It is generally supposed that removing the foliage would keep them green rather than ripen them. We should have more definite information as to whether it is better to remove all foliage or whether it is desirable to remove a small portion of the foliage, thus letting the sun get at the fruit more. On about three-fourths of our Farms I suppose 75 per cent of the crop of tomatoes is not ripe when frost comes. It has been found by different experimenters that there are several methods of ripening tomatoes. I think it advisable for us to outline a series of experiments as to how best to ripen tomatoes after they are picked. Mr. Langelier has sent me methods of his own on the ripening of tomatoes. At present, I do not think there is any good, accurate information with regard to this.

Q. What is the difference in the total weight of yield from plants trained to one stem and on the ground?

A. Here we would not get much over half, trained to one stem. It is usually considerably less, but the plants can be be planted just twice as close, and thus the crop be little less.

Q. When you conduct this experiment would you use only one variety?

A. I have suggested two varieties.

Q. Do you prefer either of these to Alacrity?

A. Alacrity can not be got on the market at present.

Q. What are the different methods that you propose under (1) namely, different methods of starting plants according to conveniences at individual Farms?

A. A great many farmers, I am sorry to say, do not use hotbeds. We should conduct some experiments starting the seed under the same condition that the farmer does, that is generally by starting the seed in the house. One experiment should be by starting the seed, transplanting it once, another experiment transplanting it twice, then planting the plants outside.

Q. I find that this year our tomatoes did better than they ever did before. Are we likely to have better results from tomatoes if we work the ground more and retain the mositure?

A. No, not as a rule. Rich soil usually holds a greater quantity of moisture than poor soil because of the larger amount of humus in the soil. If you have a wet season you get too much leaf growth and not enough fruit, and cultivating too much will increase this. Mr. Clement of the Horticultural Station at Vineland, Ont., conducted an experiment with the Skinner Irrigation System, and he found that it did not pay, and he did not get very good results. Of course, it is a pretty dry district there, but judging from results it is better not to irrigate.

Q. One of the difficulties in the West is to keep the farmers from using manure for their tomatoes.

A. It is a very bad plan to use much manure on good soil.

Q. What are the methods of ripening the green fruit other than by putting them in sawdust, and hanging up the vines?

A. Mr. Spencer wrote me recently about putting them in crates. It is very difficult to ripen tomatoes when picked perfectly green. We should find out whether it is better to place them in the sun or in the shade. I think better results would be got in the shade than in the sun, although I have never tried any experiments with this.

A Superintendent: We have tried that, and the ones in the shade did much the better.

Mr. Macoun: Before we try this experiment it will be well to get the views of all the Superintendents, before next spring.

Q. Can we do anything with the disease of tomatoes?

A. That is largely a question of climate. For instance, some seasons disease is much worse than in others, and very often in a dry season you get "blossom end rot." The only way to overcome that is to use the best variety that will resist the disease.

Q. What is the difference in price between green tomatoes and late ripe tomatoes here?

A. But very little difference here.

A SUPERINTENDENT: In the Prairie provinces the ripe fruit is worth from 3 to 10 cents a pound, and the green about half a cent per pound.

CAULIFLOWER AND CABBAGE.

Mr. MACOUN: I find that the root maggot is very troublesome all over Canada, up as far as Fort Vermilion and probably as far as Dawson. It seems to be very widespread. I know at Agassiz, Mr. Moore has had a great deal of trouble. I think any experiments that we could try to control the root maggot would be very desirable. I have suggested three ways: (1) No tar felt paper discs; (2) tar felt paper discs put on as soon as plants are set; (3) protected with cheap cheese cloth individual cover as soon as planted.

I may say that the tarred paper disc is the best method. We have been trying them here for about fourteen years, and it is certainly the best method from our experience. As regards the third method mentioned, I do not know whether it will work out or not. It seems to me that a little cover costing about two cents each could be made. An individual cover would answer the same purpose as the tarred paper discs. A number of years ago we tried growing cauliflower under cheese cloth, and we had splendid cauliflowers. They were benefitted in two ways: (1) they were not affected with the maggot; and (2) the sun did not affect them so much. This cover could be made large enough to be left on until the cauliflower grew to a head.

Q. How high would the cheese cloth be from the ground?

A. Low enough so that the flies could not get under. The cheese cloth would be over a little hoop which would lie on the ground. We are going to start experimenting with this here to

see if we cannot work it out. By protecting the cauliflowers with the tarred paper discs we get a good crop.

Q. Do you have much trouble with the maggot in the Prairie provinces?

A. We have very little trouble. Worse some years than others.

A SUPERINTENDENT: We have never seen them at all.

Mr. MACOUN: There is no use in experimenting with them when you are not troubled with them. We do have trouble with the cabbage butterfly.

Q. How high do you put the paper discs?

A. They rest right on the ground.

Q. The cheese cloth would not last very long, would it?

A. If it lasted for a couple of years it would be quite sufficient.

Q. Is it feasible to grow cabbage by sowing the seed right out in the open?

A. We grow late cabbage here that way. We sow the seed about the third week of May. Cabbage and cauliflower require very rich soil. It should do well with you, Mr. Moore.

Q. Has the clubroot troubled you yet in British Columbia?

A. No, not yet.

PEAS.

Mr. MACOUN: The question is often asked whether it is desirable to plant one variety at different times throughout the season, or whether it is better to plant three or four varieties at the same time, to give a succession of crops. I think it well worth our trying this experiment for three years to give accurate information to the farmers as to which is better. Of course, personally, I believe it better to sow a number of varieties at once. However, some people think differently. Whether you think it better or not I do not know. Space could be left for sowing the same variety, each week, for a month. In some parts of the country a late sowing would dry up. An early variety would have to be used. I have suggested the Thos. Laxton.

Mr. HUBBARD: Gregory Surprise is by far the better variety with us.

Mr. MACOUN: The reason I did not put Gregory Surprise here is that pea has never come generally to the front in the seed trade. We consider it the best, and about the earliest variety we have got. It is not a popular commercial variety, however, as the pod is rather small.

Q. Will this seed be furnished from the Central Farm?

A. Yes, we get the seed in quantity and divide it up. The main reason we get it in quantity is that we know then that the same strain of seed is being used at all the different Farms.

Q. May we use any other seed?

A. You may use any other seed you desire.

BEANS.

Mr. MACOUN: The experiment is practically the same as that with peas. I do not know whether the varieties suggested are the best or not.

Q. Would an experiment carried on the same as for peas be worth while?

Mr. MACOUN: What do you think, Mr. Blair?

Mr. BLAIR: Yes, I think it would.

Mr. MACOUN: Here, we get very little results from the late sowing of an early variety.

A SUPERINTENDENT: It has been our experience that the Refugee or 1000 to 1 is very stringy and does not do very well.

Mr. MACOUN: Some varieties are tenderer than others. For instance, it is something similar to Squaw corn, some varieties of corn requiring higher temperatures than others, the Squaw corn doing well in relatively low temperatures. The same thing follows, no doubt, with regard to beans. Certain varieties of bean require different temperatures from others. Here we cannot grow 1000 to 1 profitably.

CELERY.

Mr. MACOUN: In connection with celery, I have just put down two experiments. It is a crop which requires quite a bit of work. The two experiments that I have proposed consist of: (1) the using of patent board blanchers; (2) using earth instead of the boards.

During this last summer we have been using here a patent board blancher which is something like ready roofing. It is just uncoiled and run along the rows of plants and it worked splendidly here. From our experience this year we find that this particular make of patent blancher is a very desirable one.

Q. You plant the celery on the level?

A. Yes, just on the level.

Q. We seem to be able to grow better celery with larger and better stalks, only much shorter, than that which is shipped in. Is that because of insufficient moisture?

A. That probably is due to the method of moulding up.

Q. When there is plenty of water available, would we have better results if we were to just run the water between the rows?

A. No doubt you would have better success, as celery is a plant which requires a great deal of water.

RHUBARB.

Mr. MACOUN: There is a very large area in Canada where rhubarb is grown quite extensively and appears to be a very profitable crop. Occasionally a man will write in telling us how much money he made from the rhubarb seed that was sent to him along with packets of flower seeds. As far as I know we have no definite information on how long it takes to grow rhubarb ready to cut, from seed. It seems very desirable that we should find this out. It would be very easy; simply sow the seed keeping the dates of sowing, dates of first cutting, and then use the rhubarb roots for forcing and conduct a forcing experiment. I have been forcing it in my cellar as long as I can remember and our rhubarb has been ready to cut for about a week now. That would be a very nice thing for farmers to know how to do. Only a few results have been published.

Q. When do you put it in the cellar, Mr. Macoun?

A. Just before winter sets in. The way we do is to dig the rhubarb and leave it outside and exposed to the frost. That gives it the resting period which seems necessary before it starts to grow again. We should compare the results of using freshly-dug roots and roots that have been dug and exposed to frost.

Q. Would you supply the seed for the rhubarb test?

A. Yes, we can supply it. Of course, ours is mixed, but we have quite a large supply of it here this winter and we are sending it out with the flower seeds. We have not started vegetable seed distribution here yet except a few improved seeds that Mr. Logsdail is sending out.

Q. Have you has any complaints about disease of the rhubarb plant?

A. Yes, quite frequently.

Q. Most of the trouble that we have experienced is that the rhubarb turns rather a pinkish yellow and later on dies. What do you think would be the cause of that?

A. You had probably better ask the Dominion Botanist as to that. A good many cases where rhubarb has failed are because the soil is exhausted. The soil is being used up all the time. Just think, the stalks are cut off and cut off right into the summer, the root becomes very weak and unless the ground is very heavily manured it will "run out."

Q. Has the rhubarb root a definite number of leaves that will grow up in one season?

A. It depends upon the amount of plant food stored up in the root. The weaker plants throw up a fewer number of stems. The stronger the root the more stems.

CONTROL OF ONION ROOT MAGGOT.

Mr. MACOUN: The Entomological Division has experimented with insecticides for the control of this. The Farms should be in a position to say which of the methods recommended from time to time is the best. Neither of the two mentioned, namely, carbolic emulsion and hellebore and water is very satisfactory.

Q. How is the carbolic emulsion made up?

A. You will find that in the new spray calendar.

Q. How about the protection against carrot rust fly? It is all over the Maritime Provinces. I use tobacco water and kerosene emulsion to control it.

Mr. MACOUN: We have not had it in our experimental plots to my knowledge.

Mr. MACOUN: I have left the potato quite near the last, although it is one of our main experiments. There are a great many experiments that could be tried, but what we want to do is to compare a few experiments that would be of the greatest practical benefit to the farmers. Mr. Munro has been carrying on some experiments with the cutting of the seed, etc., but some uniform test should be carried on by the different Farms. I have suggested four different kinds of set to be used: (1) Whole, small potatoes not exceeding a certain weight; (2) sets cut to one eye; (3) sets cut to two eyes; (4) sets cut to three eyes. All to be cut from medium to large potatoes. A good many farmers use small potatoes, and I think it is our duty to get some definite information as to just which method is the most profitable one to adopt.

Q. In dry weather, potatoes cut to one eye will dry up too much, will they not?

A. If there is not much flesh attached to the eye the potato will dry up.

Mr. MACOUN: Evidently seed is very short in the West, because many people write wanting to know if potato peelings can be used for seed. I have suggested that by putting the peelings in sawdust and protecting them from drying up, they may be planted. That was all I could suggest to them.

Q. Do you know what makes the potato seed remain in the ground the whole season without rotting?

A. Of course, if the soil is very dry, the potato will remain without rotting.

A SUPERINTENDENT: The seed looked the same as when planted, but the trouble was, this year, that the plant didn't grow.

Q. What does that first section under "Potatoes" refer to?

A. Yes, I was just going to take that up. I have written here two types of potatoes, one having strong buds from seed end to base, one having strong buds towards seed end only. In our experience years ago we found that we got different results from different kinds of potatoes. The Early Rose type has strong buds developing from one end of the potato to the other. Some of the other types have only a strong bud at the seed end. Other types have thick masses of eyes at the seed end.

Q. Where they have thick masses at the end, it would be hard to cut them to one eye?

A. The eye could be got a little farther down.

Q. With more eyes on the potato no more stalks are developed?

A. No matter how many eyes are on a potato, only a few stalks develop. In our experience it pays to use three eyes.

Q. How about the distance of planting?

A. I have suggested an experiment a little farther down. It might be that one-eye sets could be planted a little closer than three-eye sets.

A SUPERINTENDENT: In the Prairie provinces it would be desirable to use some gypsum on the potato after cutting it for seed. It has been found that the using of gypsum makes quite a difference in the crop.

A SUPERINTENDENT: Under our conditions, $2\frac{1}{2}$ feet apart is too close together, that is, when not irrigating. Better results are obtained when put farther apart.

Mr. MACOUN: Do you not think it would be important to have printed matter showing the difference obtained in planting wider than $2\frac{1}{2}$ feet apart. My idea is to have figures that we could give to farmers that will show results that will be useful to them.

Q. What do you mean by three cultivations?

A. It has been found that the more cultivation given to the potato crop, the better the crop will be. I did not put in the details there, but I should be glad of a discussion on different methods of cultivation. What we want to do is to show the average farmer that the more cultivation the better the results. My idea was to give two harrowings before the potatoes were up, then three cultivations after the potatoes were up. Then to have another plot with two harrowings before the potatoes were up and six cultivations after the potatoes were up.

(NOTE.—A short discussion took place here on harrowing and its importance was emphasized, especially in certain seasons.)

A SUPERINTENDENT FROM PRAIRIE PROVINCES: Most of the farmers in the West harrow once.

Mr. MACOUN: The farmers in Ontario don't, at least a good many of them don't, but they should.

A Superintendent from Prairie Provinces: They do in the West; they just give them one harrowing for luck.

Q. Have you had any results from the use of a potato planter, or planting them with the plough, or any other method of planting?

A. From our experience here the potato planter is an economical method of planting.

A Superintendent: It is all right for long rows, but for small plots it is not much use.

Mr. Macoun: What size of plot would you suggest for the experiment, that is the largest area of the individual plot?

A Superintendent: Well, in our case there is only one length of row that I can use, and that is 70 feet, but I can use as many rows as I like.

Mr. Macoun: How would one-fortieth of an acre be? There are about nine different experiments. Perhaps one-twentieth of an acre would suit everyone better.

A Superintendent: Of course we will have to have more than one-fortieth, or even one-twentieth of an acre to conduct a main-crop experiment.

Mr. Macoun: With regard to the cost of growing potatoes, Mr. Hubbard has published results on this, and I think it desirable that more of the Farms do so. It might be well to carry from three to five-year experiments to determine this.

thinning experiments with carrots, beets, parsnips.

Mr. Macoun: It seems to me that it would be desirable to have a three to four years' test, so as to be in a position to recommend to farmers from our own experience the importance of thinning and the method of thinning.

As this covers all of the proposed experiments, before leaving this point I should like to ask the Superintendents here whether this outline would be practicable on all of the different Farms. Before spring we can draw up the experiments in greater detail and submit them to you. The more Farms that can use these experiments the better. My idea is to get some definite start on all of the Farms, if possible. I might have suggested about three times the number of experiments that I have, but I thought it better to suggest those that could

be carried on without increased labour on the Farms and yet be experiments that would be of the most practical use to the farmer.

Q. Mr. Macoun, there is one thing I should like to ask you. What about the difference between early and late varieties of potatoes?

A. The early potatoes only yield a little over half of that of the main crop varieties with us. I think an experiment should be conducted to show the farmers the difference in profit from early and late varieties.

I think it would be a good thing to experiment with the dates of planting and see what difference there is in the yield. In Ireland, if potatoes are started in boxes instead of outside, nearly double the quantity is produced.

Outline of Cultural Experiments in Vegetables on Experimental Farms and Stations (three- to five-year periods.)

onions.

Small area ploughed in fall and harrowed and raked in spring.

Small area ploughed in spring, harrowed, and raked.

Fall *versus* spring sowing.

Comparison of culture of three varieties:—

Early Flat Red, Large Red Wethersfield, Yellow Globe Danvers,	Prairie Provinces.
Large Red Wethersfield, Yellow Globe Danvers, Prize Taker,	Other Provinces.

1. Grown from seed sown in open and thinned to 1, 2, and 3 inches apart.

2. Grown from young plants started in the hotbed and transplanted to open ground.

3. Grown from onion sets.

TOMATOES.

Comparison of culture of two varieties:-

Sunnybrook Strain of Earliana,
Chalk's Early Jewel.

1. Different methods of starting plants according to convenience at individual Farms.
2. Allowed to grow unpruned and left lying on the ground.
3. Pruned to one stem.
4. Pruned to two stems.
   (a) Tied to stakes.
   (b) Tied to wire.
   (c) Removing a certain proportion of foliage.
   (d) Not removing any foliage.
5. Methods of ripening green or partly ripe fruit.

CAULIFLOWER, CABBAGE.

Cauliflower.—Early Dwarf Erfurt and Early Snowball.
Cabbage.—Early Jersey Wakefield and Copenhagen Market.
Protection from Root Maggots —2 dozen plants in each test.
1. No tar felt paper discs.
2. Tar felt paper discs put on as soon as plants are set.
3. Protected with cheap cheese cloth individual cover, as soon as planted.

PEAS.

Comparison of relative advantages of a succession of varieties of different seasons with a single variety planted, say, at intervals of a week apart for four weeks.

Thos. Laxton, Gradus, McLean's Advancer, Stratagem, or Thos. Laxton.

BEANS.

Comparison of relative advantages of a succession of varieties of different seasons with same variety planted, say, at intervals of a week apart for four weeks.

Round Pod Kidney Wax, Stringless Green Pod, Refugee or 1000 to 1; and

Round Pod Kidney Wax and Stringless Green Pod sown every week.

CELERY.

Variety.—Golden Self Blanching.

Methods of Blanching—

1. With patent board blanchers.
2. With earth.

RHUBARB.

Growing Rhubarb from seed.

A. To learn how long it takes to become large enough to cut.

B. To become large enough to force.

C. Experiment in forcing in the cellar of dwellings.

CONTROL OF ONION ROOT MAGGOTS.

Test of the methods recommended from time to time, beginning with carbolic emulsion and hellebore and water.

POTATOES.

Kind of Sets.—Two types of potatoes, one having strong buds from seed end to base, one having strong buds towards seed end only.

1. Whole, small potatoes not exceeding a certain weight.
2. Sets cut to 1 eye.
3. Sets cut to 2 eyes. } Cut from medium to large potatoes.
4. Sets cut to 3 eyes.

Kind of Cultivation—

1. Three cultivations.
2. Six cultivations.

Level or hilled—

1. Level cultivation.
2. Hilled after last cultivation.

Distance apart of planting, using sets having at least three eyes, two varieties used—Irish Cobbler and Gold Coin, or some other:—

1. Rows $2\frac{1}{2}$ feet apart.
2. Rows 3 feet apart.
1A 2A. Sets 12 inches apart.
1B 2B. Sets 14 inches apart.
1C 2C. Sets 16 inches apart.

Cost of growing 1 acre of potatoes:—
Half-acre best Early Variety.
Half-acre best Main Crop Variety.

THINNING EXPERIMENTS WITH CARROTS, BEETS, PARSNIPS.

Carrots, thinned to $1\frac{1}{2}$, 2, and 3 inches apart.
Beets, " 2, 3 and 4 inches apart.
Parsnips, " 2, 3, and 4 inches apart.

Friday, January 15: Session 2.30 to 4 p.m.

EXHIBITION WORK.—MR. WATSON.

After lunch the Director and staff, with the Superintendents and guests, assembled in the Auditorium, where there was set up, as an example, the staging for one exhibition circuit complete. Mr. Watson explained that the staging had been planned to meet the varying conditions in size and shape of buildings, and to furnish an attractive, durable wall-covering which could be readily put up and taken down.

After an examination of the stage arrangements and an exchange of views regarding the same, the party returned to the lecture room, the Director presiding.

DIRECTOR: As I intimated yesterday, we expect to be able this year to do a great deal more in exhibition work than we did last year. We want every farmer in Canada to know that we are working for his good, and there is no better way of accomplishing this than by showing at the fairs, and particularly the smaller county fairs. Last year was the first time that we undertook to make exhibits of any considerable size at the fairs in Canada. We attended about twenty of the leading exhibitions, with excellent results. We received reports on our exhibit from our various Superintendents and from men who

accompanied the exhibits, as well as from the managers of the various fairs, and from many visitors. Some of the reports were sent in writing and some were obtained from conversation with men who had seen the exhibit. I am pleased to say that these reports were so satisfactory and indicated so clearly the good that could be done by our exhibits, not only in instructing the farmers, but also in making known what the Farms are doing, that this year we have decided to put greater stress on exhibition work.

The results and reports were so good that we took the matter up with the Honourable Minister of Agriculture, and he viewed it in the same way as I did, and was quite willing to let me put a special vote in the Estimates for next year. It is now ten thousand dollars, but in addition to this, as heretofore, you will each do a good deal in the way of exhibition work out of your own votes for exhibition work. We propose to prepare these exhibits along lines which will be explained by Mr. Watson. We will send one of these exhibits to each of the various branch Farms, and the expenses of this will be out of this ten-thousand dollar vote. We will expect you to defray from your own vote the expenses connected with showing at the various fairs. It will be necessary to supplement this amount next year, as the expenses will very much exceed the amount of the appropriation. We can only learn by experience. There were 685 fairs held during 1914 throughout the Dominion. Of course, we cannot attend all these, but we want to attend the principal small fairs, if I may describe them in that way, in each of your districts, probably one-quarter, or less than that. This is our first organized attempt in this kind of work, but I do not think there will be any question of the advisability of continuing. There is no doubt of its doing good and of its being appreciated. Last year we attended a small fair here, and our exhibits were the main feature of the show. We will be doing an excellent work if we put up a good exhibit. We do not want a tremendous amount of anything, just a few good things that are of interest to every farmer who comes in.

This, briefly, is an outline of the policy in connection with our Exhibition work, and I would ask you all to give this consideration, and make it—the Dominion Experimental Farms' Exhibit—the main feature at all the fairs where you attend.

Mr. Watson will now give particulars of what we propose to do this year.

NECESSITY OF PUBLICITY.

Mr. Watson: Mr. Grisdale and Gentlemen,—I am glad to have this opportunity of discussing with you the very necessary work of Publicity in connection with the Dominion Experimental Farms System. There is no question about the importance and necessity of some organized and systematic scheme for making known as widely as possible, both the location of our Experimental Farms and Stations, and the work they are doing. Until the knowledge you have gained in the field and in the laboratory has been put into practical operation by the agriculturist, your work is incomplete, of but limited value, and the Farms will not have carried out fully the work for which they were incepted, some twenty-eight years ago. Situated as you are in every province of the Dominion, by experimental work and by research work you have gained and are gaining a mass of information which would be of incaluable value to the farmers of Canada, but the results of your work do not always reach the men who are chiefly in need of your assistance. At least, such would seem to be the case if we may judge from the comparatively small number of applications received for the publications of the Experimental Farms.

EXPERIMENTAL FARMS MAILING LIST.

There are approximately 725,000 farmers throughout the Dominion. On the Experimental Farms mailing list there are, I understand from Mr. Spencer, some 70,000 names of English-speaking and 12,500 of French-speaking persons, or a little better than 11 per cent of the farmers of Canada are sufficiently interested in the system to take the trouble to ask for our publications. There can be only one reason, it seems to me, why the other 682,000-odd active farmers do not ask for our literature, and that is: They have no knowledge or very little knowledge of the valuable work being done by the Experimental Farms and Stations.

The Director has just told you that he wants every farmer from the Atlantic to the Pacific to know and feel that we are working for his benefit, and also to have at least 500,000 of them send in their applications for our publications. We are not going to fill that order in one year, or in two years; but with that objective, we have planned for a somewhat active and extended Publicity Campaign, and with your interested co-operation, we shall make an impression from which good and permanent results will follow.

EXHIBITIONS AND FAIRS.

There are several schemes under consideration, whereby this Publicity Campaign may be carried out, the principal one of which we are now here to discuss, that is: the placing of a "Dominion Experimental Farms Exhibit" at the principal exhibitions and fairs. Throughout the Dominion last year, there were held 685 exhibitions and fairs. It is proposed to attend as many of these as possible, and I now give you the details of what is considered the most economical and effective means of carrying out that work. I would ask you to criticize freely, and shall be glad to have a full discussion and to receive any suggestions you may care to offer.

DOMINION EXPERIMENTAL FARMS EXHIBIT—ORGANIZATION.

It is planned to make the Central Experimental Farm the headquarters of organization, but to have each branch Farm and Station an operating centre for a circuit covering the district nearest to it and within its own province. We shall assemble at Ottawa twenty complete exhibits, each of which will include a limited but useful exhibit from all of the Divisions at the Central Experimental Farm. One complete exhibit, together with the staging of panels, an outline map of the Dominion showing the locations of the various Experimental Farms and Stations, curtains and table covering similar to that which you have already examined, will be shipped to each of the branch Farms. The Superintendent at each branch Farm will prepare an exhibit of such size and material as he considers will best represent his Farm. This, together with the material received from Ottawa, will form one complete "Dominion Experimental Farms Exhibit" for one circuit of fairs.

The Superintendent at each branch Farm and Station will make arrangements to have the exhibits shown at as many fairs within his province as it will be possible to attend, arranging his circuit according to the sequence of dates, and covering the whole of the exhibition season.

We should like to get from each of you, as soon as you have completed arrangements, a copy of the itinerary for each circuit, so that we may have here a record and keep informed as to the fairs it is proposed to attend.

It will not, of course, be possible for the Superintendent personally to accompany the exhibit, but he no doubt will be able to spend some time at the principal exhibitions within his circuit. It would probably be advisable early in the season to detail a man at each branch Farm to get together the material and to post himself on the various articles he is preparing for exhibition. This same man should have charge of the exhibit throughout the whole season, and should accompany it to the various places arranged for. At the close of the season the exhibit, including all material and staging received from the Central Experimental Farm, will be returned to the branch Farm from which it has been operating, where it will remain for instructional purposes, for visitors, or for use at local Agricultural Society meetings, and for future exhibitions.

In addition to the exhibit there will be forwarded from Ottawa a supply of Exhibition circulars and a number of Mailing List forms, the latter to be forwarded to the Central Experimental Farm when filled out with the name and address and request of the applicant.

EXPENDITURES.

All the expenses in connection with the preparation of the exhibit material at the Central Experimental Farm and the expenses of shipping the same to the branch Farms will be charged to the "special vote," but operating and other expenses incurred after the exhibit has reached the branch Farm will be charged to the account of that branch Farm.

The itinerary for the exhibitions and fairs to be held in Ontario will be arranged and operated from the Central Experimental Farm.

A record will be kept at the Central Experimental Farm of the exhibitions and fairs attended during the year, so that those which it had not been possible to visit during that year will be given preference the following season.

Such is the plan which has been submitted to the Director and which, as he has told you, he approves of. We hope you will feel that the Publicity work is of sufficient importance to receive some special attention, at least this year, and we will be glad if you will let us have any suggestions bearing particularly upon conditions in your locality. I am sure that you are all pleased to hear from the Director that the results from the exhibition work last year were sufficiently marked to warrant him in recommending to the Honourable the Minister of Agriculture a continuance and expansion of the work, and that the Honourable Minister was pleased to consider favourably those recommendations.

DIRECTOR: Mr. Watson has given you the details of what it is proposed to do in the way of exhibition work this year, and I shall be glad if you will discuss what has been said. If you have any objections to make, now is the time to make them; do not wait until you get back home and then write and say you do not approve of some of these things. Any suggestions from the officers of the Central Experimental Farm will be very much appreciated. I have looked into this matter very carefully and have discussed it several times with Mr. Watson, and I am satisfied that we can do good work following out the organization as now explained.

A SUPERINTENDENT: What is the width of the green curtains which run about the panels?

Mr. WATSON: About 2 feet.

A SUPERINTENDENT: I think it would be well to have the curtain at least double that width, as in the case of high buildings there will be more wall space to cover.

Mr. WATSON: That is a good suggestion, and I shall make a note of it.

A SUPERINTENDENT: Can you let us know at an early date what will make up the exhibit sent from Ottawa?

Mr. WATSON: Would you want to know exactly what would be sent from each of the Divisions?

A SUPERINTENDENT: Yes, I think so, as otherwise we might duplicate your exhibit.

Mr. WATSON: If you get the particulars by about May 1 would that be soon enough?

A SUPERINTENDENT: Yes, I think so.

A SUPERINTENDENT: I do not think we shall be able to attend very many fairs, as they nearly all come together; that is, there are a number held on the same dates.

Mr. WATSON: Last year the dates of the fairs ranged from the third week in June to October 30, or four full months. In Ontario most of them came during September and October, but in Alberta there were twelve in July, thirty-two in August, forty-seven in September, and fourteen in October; while in Manitoba and Saskatchewan, July and August included practically all the fairs. In the other provinces, September and October are the months for exhibitions and fairs. If we have to consider only the dates of the exhibitions, I think it will be possible to cover more than one-third of the fairs, and perhaps one-half.

A SUPERINTENDENT: Who will decide what fairs are to be attended?

Mr. WATSON: The Superintendent will decide where he proposes to exhibit, but he will take in as many as it will be possible with the one complete outfit. He may not consider it necessary to take the whole of the exhibit to some of the small fairs, where there would not be accommodation for it, but I think it would be well not to overlook the small fairs, as a great deal of good can be done there, since our exhibit will probably be the main feature.

A SUPERINTENDENT: It will not be possible for the Superintendent to attend all the fairs.

Mr. WATSON: No, that was not expected. As already explained, a man should be engaged at the branch Farms to take charge of the exhibition work.

DIRECTOR: When the Agricultural Colleges close for the term in the spring, it is generally possible to secure some bright young student who could undertake this work, for many of them are glad of the opportunity of earning a little money to help in next year's course. He could take charge of the exhibit, looking after the proper arrangement of the same, and could

give any information needed about it. One man would not be enough when on the road, and on some of the branch Farms it will be necessary to engage two men. The second one need not be engaged until about the time that the exhibit is starting on the circuit, and he need not be so well trained as the first man, but rather of a cheaper class of labour, as he would be required mainly to assist in handling the exhibit.

A SUPERINTENDENT: Would it not be advisable to send out the assistant from the branch Farm so that when he returned with the exhibit the information he may have gained could be kept on the Farm?

DIRECTOR: Yes, where it is possible.

A SUPERINTENDENT: What is the size of the panels?

Mr. WATSON: Six feet by three feet each, with the exception of the map panel, which is 6 feet by 6 feet.

A SUPERINTENDENT: Last year at Charlottetown there were some criticisms about the name "Dominion Experimental Farms Exhibit" being too high up, as it could not be seen when standing close to the exhibit.

Mr. WATSON: It was only 7 feet above the tables, but there will be no criticism in that respect this year as the name will be on the map panel, and not very high up.

A SUPERINTENDENT: Are placards necessary?

Mr. WATSON: I am not in favour of putting on the walls very much written matter, as I do not think it is read. A few comparatively small cards, say 2 feet by 3 feet, giving the names of varieties recommended for a particular district, or a few brief sentences, are more effective, but they should be very few. The Exhibition Circulars proved particularly valuable last year, as fairly full information and figures on most subjects can be printed on the four pages of these circulars, and can be studied by any one at leisure.

Dr. SAUNDERS: With regard to the grain exhibit, I very much favour showing threshed grain in open receptacles, the same as was done last year, so that it can be handled by those who are interested. Of course, some of it will be spilled and probably get mixed with other grains tabled, but if a reserve stock is carried there will be no difficulty in replenishing. Of course, it would be well also to have some grain in the sheaf. I also think that the grain for exhibit should be taken as much

as possible from stock grown in the locality of the fair.

DIRECTOR: You will probably have applications to show live stock at some of the exhibitions this year. Now such applications will have to be refused, as we can not undertake to show live stock at the exhibitions.

A SUPERINTENDENT: Does that include poultry?

DIRECTOR: No, I do not mind you taking a few hens.

A SUPERINTENDENT: Does it apply to live stock for the Short Course demonstrations?

DIRECTOR: No.

A SUPERINTENDENT: What do you think of the value of photographs to go with exhibits?

Mr. WATSON: They are excellent for decorative purposes, but I do not think that for that purpose alone the expense is warranted—every photograph should illustrate some particular point or points, and teach some lesson.

A SUPERINTENDENT: Are models more valuable than photographs?

Mr. WATSON: Generally they are, because they catch the eye and arouse interest, which leads to further examination. The models we used last year undoubtedly justified the expense of making them, and it is proposed again this year to include models wherever they can be used advantageously.

Mr. ELFORD: I am strongly in favour of models. I may say that among the models we are planning to have this year will be some of carcasses of fowls with the breast removed and showing the organs both in the natural healthy state and colour, and also organs showing distortions and discolorations due to certain common diseases.

DIRECTOR: I should like to have any suggestions you care to offer, and if you should require models for your own exhibit if you will let us have your particulars in time we will have the models made for you.

Mr. Sladen has made some plans for exhibition work, and I will ask him to say a few words along that line.

Mr. SLADEN: With regard to the exhibit of bees which I am planning, I expect to supply each branch Farm with an observation hive. Arrangements have been made for a number of model hives exactly one-half the size of the regular hives, which will make them more portable. We will also have

some models showing foul brood magnified about six times, showing healthy larvae and diseased larvae. I think it will be well also if each exhibit includes a small display of honey, both the extracted and the comb.

DIRECTOR: Mr. Langelier has had a great deal of experience in exhibiting and has made some especially fine exhibits of flowers at Quebec. I will ask him to say a few words.

Mr. LANGELIER: We have had some very successful exhibits at Quebec, and have always used a great many flowers, as they add so much to the attractiveness of the exhibit, and at the same time show what varieties can be successfully grown. Wherever it is possible, I think, it would be well to table some flowers.

With regard to staging material, that is, the panels, if we could have two sets for my circuit it would help us very much. Dates between the principal exhibitions are so close that it is almost impossible to get from one place to another in time to put up a decent display. Last year we managed it only by working all through the night, and in one case barely got from Quebec City Exposition to Sherbrooke. With two sets of panels we could leave one up at Quebec and by covering it with paper and cheese cloth it would be protected and in good shape for us next year. The other set of panels we could use in covering the rest of the circuit. I may say that some of the principal exhibitors at Quebec make a practice of doing this, and in some cases I know that the staging, framework, etc., remains up year after year. It really is the most economical way, as it saves not only the labour each year of putting up and taking down but also transportation costs.

DIRECTOR: You have now heard the plans which it is proposed to adopt for exhibition work this year, and I shall ask you to co-operate and to do what you can to make the Dominion Experimental Farms' Exhibit, if not the main feature, at least one of the main features at all of the fairs in your circuits.

The meeting adjourned at 4 p.m.

Friday, January 15. Session 4.00 to 5.30 p.m.

FERTILIZERS.—DR. SHUTT.

(PRESENT: Messrs. Baird, Begin, Blair, Clark, Helmer, Hubbard, Langelier, McClary, Moore, and Parham.)

Dr. SHUTT: It is not my intention, gentlemen, on this occasion to deliver a lecture on the subject of fertilizers, but I think it may be well for me to say something of the principles that underlie our plans for the work we are undertaking in this new field of investigation—a work from which we hope to obtain results that will enable us to advise our farmers more definitely than we can now as to the profitable use of commercial fertilizers.

It is true that we have done more or less investigatory work with fertilizers since the early years of the institution of the Experimental Farm system, but it has been largely of a disconnected and fragmentary character; it has not been comprehensive and, in many cases, not conclusive. I would not have you think, however, that it has been valueless. We have obtained some results of very considerable importance, and certain of these I may now enumerate.

1. We found that the yields of all our staple crops were higher on plots dressed with barnyard manure, applied at the rate of 15 tons per acre, than on the other plots of the series dressed with commercial fertilizers in various mixtures and proportions.

It has been demonstrated that, weight for weight, fresh manure has given crop yields almost equal to those from rotted manure. As much loss in plant food and organic matter results in the rotting manure, from excessive fermentation and leaching, the economy of applying manure when fresh is emphasized by our experiments.

2. We found that where the dressing was partly manure and partly commercial fertilizer, the yield was invariably higher than on the plots with fertilizer only, though the application of the latter might be twice that of the plots with manure and fertilizer.

All this work leads us to conclude that manure has a much greater value than is to be found by calculating the amounts of nitrogen, phosphoric acid, and potash it contains. It furnishes humus-forming material of a particularly valuable character, and we are well aware of the many ways, physical and chemical, in which humus improves and benefits a soil. Again, it is humus that supports the microbic life of the soil, and it is this life which performs such a valuable function in preparing plant food in the soil and presenting it in forms available for crop use. In these particulars, fertilizers play no part, for they do not furnish any humus-forming material. In a word, commercial fertilizers are no substitute for manure; to be used profitably we conclude they must be employed to supplement the stock of manure. We cannot hope to carry on farming profitably by the exclusive use of fertilizers.

3. Next we made very clear the great value of clover and other legumes for keeping up the fertility of the soil. This was demonstrated over and over again. In many instances crop yields were obtained after turning under an aftermath of clover that fully equalled those from land dressed with manure at the rate of 10 tons per acre. Our work in determining the manurial value of the legumes is most satisfactory, encouraging, and conclusive. It not only showed the large gain of nitrogen to the soil, due to the unique property which the legume possesses of appropriating atmospheric nitrogen, but emphasized and confirmed our deductions as to the great value of humus for the improvement of soils.

4. Judiciously used, a profit may be obtained from fertilizers. Much will depend on the character of the land and the nature and value of the crop. Fertilizers appear to pay best on a high-priced crop, such as potatoes.

The largest returns from fertilizers, that is the greatest profits, do not necessarily result from excessive, or even very large, applications of fertilizers. Many of our largest profits have resulted from comparatively small dressings—300 to 500 pounds per acre. This points to the conclusion that the function of fertilizers is to raise the small proportion of available plant food in the soil, rather than to increase the amount of the total plant food therein contained. We must bear this in mind in all our work. It is altogether too expensive to build up a soil,

to materially increase its percentages of plant food, by the use of fertilizers.

5. In the larger number of instances we have found it is more profitable to use a complete fertilizer, that is, one that furnishes nitrogen, phosphoric acid, and potash, than one containing, say, nitrogen and phosphoric acid or any other combination of two of the elements. In general practice, and unless there are special considerations, we always advise a complete fertilizer, for by its use there is less risk of failure and a greater expectation of profit.

6. For the potato crop—perhaps the chief of our crops receiving fertilizer—we have found that it is well to apply the nitrogen, partly as nitrate of soda and partly as sulphate of ammonia, and a dressing of 75 pounds of each, per acre, is about the maximum dressing on a soil in fair condition that can be applied with profit. Possibly we may find that organic forms of nitrogen may be useful, more particularly on warm, moist, well-aerated soils, for promoting growth during the latter weeks of the season. Fish waste, sea-weed, bone-meal may all be valuable in this way, but as yet we have no conclusive data on the matter.

7. We have not found that large applications of potash compounds are profitable. So far as our results are concerned, 100 pounds muriate of potash may be considered a maximum dressing per acre. Frequently 50 pounds per acre has given the maximum profit as regards a potash application.

These are some of the more important conclusions from our work.

Something less than two years ago, the control of the experimental work with fertilizers on the Farms and Stations was assigned to the Division of Chemistry, and realizing the increasing importance of the work, I at once began to plan for its more thorough and systematic prosecution. We have already made a very creditable beginning at Kentville, N.S., and Fredericton, N.B., with the co-operation of Superintendents Blair and Hubbard. The testing out of the soil as to its uniformity on areas to be devoted permanently to this experimental work, has been carried out at Cap Rouge, Que., Agassiz, B.C., and Charlottetown, P.E.I.

It was evident to me from the outset that if this new work was to be carried forward in a satisfactory manner it would be necessary to appoint one of our assistant chemists to make a special study of it in all its details, to collate and tabulate the results and otherwise assist me in its prosecution. My ever-increasing duties would prevent me, unassisted, from giving sufficient time and study to carry it forward with vigour and satisfaction. I am pleased to state that Mr. A. T. Stuart of the chemical staff has undertaken this work and that he has already shown exceptional aptitude for it. He has made an exhaustive study of fertilizer experiments made in Europe and the United States and has been able to draw some valuable conclusions therefrom that will be of great assistance in planning our future work. He has further, with great ingenuity, prepared a plan of investigation with fertilizers which is both scientific and comprehensive. He has prepared, at my request, a summary of his findings and of his proposed plan for exploiting the whole field with respect to the values of the several fertilizing materials and the amounts that can be economically employed, and this summary I shall put in your hands for your thoughtful study. He has shown, and I think conclusively, that in comparing the effectiveness of fertilizers, single or mixed, we must first ascertain the minimum amount requisite for the maximum yield. To do this we must apply the fertilizer in several amounts and from the crop yields determine the minimum. Liebig considered that the increase of yield was directly proportional to the application of the element applied in minimum amount until the limit of yield was reached. Mitcherlich profoundly modified this conception and stated that the first and comparatively small application resulted in the greatest increase and that with further applications the increases in yield became less and less until the limit was reached. Mr. Stuart in his paper has illustrated this in a graphic way by diagrams which you will all readily understand. He has further constructed or devised a three-dimension diagram which will allow us to plot all possible combinations of the three essential elements of fertility. This we shall adopt as our working basis, applying it as the area at our disposal on the several branch Farms and Stations permit.

To ensure uniformity in composition of the fertilizing materials employed, and at the same time to save labour on the part of the Superintendents, we propose to do all the necessary mixing, etc., here and to send the several mixtures bagged and labelled according to plot to the Farms and Stations. All that will be necessary at the branch Farms in the spring will be for the Superintendents to see that the fertilizers are carefully applied as noted on the label. The area, and consequently the number of plots, varies on the several Farms and Stations, but if rough sketches or plans are sent in by you, the fertilizer will here be put up accordingly.

We propose to try out, as far as may be practicable, in three amounts or rates of application, some ten mixtures containing nitrogen, phosphoric acid, and potash in varying proportions. This should give us very valuable information as to the most desirable formula to use, and the most profitable amounts to apply.

We shall experiment with forms of nitrogen, phosphoric acid, and potash applied singly and in combinations of twos, *e.g.*, nitrogen and phosphoric acid, nitrogen and potash, potash and phosphoric acid.

Another series of plots will test the respective merits of different forms of nitrogenous and phosphatic fertilizers.

And, lastly, there will be plots with manure only, and manure with small dressings of various mixtures of fertilizers.

We propose, at the outset at all events, to adopt a three-year rotation: a root crop, probably potatoes, upon which the application of the fertilizer will be made; a grain crop seeded down with clover and timothy; and, the third year, hay. This in outline is our scheme, and I ask for your enthusiastic and careful co-operation in carrying it out.

DISCUSSION.

At the outset, several Superintendents referred to the fact that in the testing out of the permanent fertilizer area, very considerable difference in crop yield had been observed between the several plots, at times between almost adjacent plots. Could reliable results be hoped for from such an area? Should not the plots showing the greatest differences be struck

out before applying the several fertilizers? Would it not be desirable to continue the preliminary work of testing out the area?

Dr. SHUTT: It is certainly regrettable that these areas—I might include all the areas tested—have shown such a lack of uniformity. For the most part, those on the eastern Stations are on newly-cleared land, unmanured, and the test crop was the first they had borne. In clearing land, the subsoil in places was brought to the surface—to some extent this was unavoidable. Little, however, was to be gained by selecting another area—it might be equally unsatisfactory—nor was there any evidence to show that greater uniformity in the soil would be arrived at by continuing the testing-out process. Conditions were not as satisfactory as might be desired, but, all things considered, it was advisable to proceed with the experimental work. We might hope that the plots receiving the correct treatment as to manures and fertilizers—whatever that treatment might prove to be—would out-distance the others and thus, by their increased crop yields, indicate emphatically the most profitable mixtures and the amounts of them which would be most economical to employ. In the course of time, the results would undoubtedly more and more indicate the most profitable fertilizer. No area could be found that would be absolutely uniform, and differences in yield of 10 per cent and under would not be regarded as of any special significance.

Q. The question was asked if on land too poor to give any results, an initial application of fertilizer might not be made over the whole area?

Dr. SHUTT: This might very seriously affect the soil for many years and in ways impossible to foretell. The practice is therefore undesirable.

Q. Has the size of plots, width of roads and of paths been determined for the whole series? Are they uniform throughout?

Dr. SHUTT: The size of the plots will be one-twentieth of an acre each, except in one or possibly two instances, where the area at our disposal will necessitate us making the plots one-fortieth of an acre each.

The roads will be 16 feet wide and the paths between the plots 4 feet.

Q. Are there any objections to planting the whole area and cutting out the plots just before harvesting the crop?

Dr. SHUTT: Such a plan would no doubt tend towards making the moisture condition over the whole area more uniform, and that would be an advantage, but there are several objections, in my opinion, to the scheme. If the crop were over the whole field or area, it seems to me that there would be additional work in re-surveying or locating the plots at the time of harvest, and, further, that it would be almost impossible to take notes of growth, etc., assigning the records to the proper plots, during the summer. It is true that when the roads and paths are kept free of weeds and cultivated, the crops on the edges of the plots can avail themselves of more moisture than the crop in the centre of the plot, and we frequently find increased growth therefrom on the edges of the plot, say for 12 inches or so. It seems to me that we could obviate this error by planting say, 1 foot of the paths and roads adjoining the plots. The crop on this 1-foot area would be removed before harvesting. Naturally this would reduce the width of the paths to 2-feet, and of the roads to 14 feet, but that would not be a serious matter.

(See also under Part III, Special Articles, "Fertilizer Experiments on the Dominion Experimental Farms," by A. T. Stuart, B.A.)

Friday, January 15.—Session 4.00 to 5.30 p.m.

CULTURAL WORK.—MR. GRISDALE.

PRESENT: Messrs. McKillican, Munro, Tinline, Hutton, and Fairfield.

J. H. GRISDALE: It seems that about the only thing is to discuss whether these cultural experiments are of any use, and if not, why not, and what we can do to solve some of the problems that confront us along these lines. Even if these experiments are not effective, the problems exist just the same. No one is sure how to handle manure, seeding, etc. You differ in recommendations from year to year.

G. H. HUTTON: Does this difference go to show that we are wrong?

J. H. GRISDALE: Either the work is badly planned or badly carried out.

W. C. McKillican: I cannot offer a sufficient explanation of the very unsatisfactory results we have had, but it is not due to the work; it is being carefully carried out, and yet our results are bringing us nowhere. We have arrived at no conclusions in three years' work; it doesn't make any difference what we do.

W. A. Munro: Take the experiment "Prairie Breaking." The plot is too small, and gopher runs make a difference in results, as the plots are insufficient.

W. C. McKillican: The difficulty is due to so much continual summer-fallow around the roads and paths which prevents the difference in treatment from giving results.

J. H. Grisdale: Is there any way of overcoming that?

W. C. McKillican: I believe that at Saskatoon they fill the paths and drill 4 feet past the ends of the plots where one variety and one rate of seeding is used throughout.

J. H. Grisdale: Definite results in two or three years go to show that the plan is not entirely wrong.

W. A. Munro: Definite results on manured plots.

G. H. Hutton: Definite results on land with no manure.

W. C. McKillican: Proved by experiments that 3 or 4 inches ploughing is better than deep ploughing.

W. H. Fairfield: According to Rennie, land should not be ploughed more than 3 or 4 inches.

J. H. Grisdale: Written for use in the Province of Ontario, not applicable to all provinces.

Q. Is it worth while to continue these experiments for two or more years before we agree to abandon or modify them?

W. H. Fairfield: Personally I should like to continue for one year longer.

J. H. Grisdale: We must try to solve the problems and study them carefully before we attempt to devise something different. I think it advisable to study it more closely.

M. J. Tinline: At Brandon there is much couch grass, and different treatment is necessary. Good results were obtained from packing. Seeded-down experiments were better after grain and roots than summer-fallow. Seeded without a nurse crop was better than with a nurse crop.

W. H. Fairfield: Good results in some experiments, and none in others.

W. C. McKillican: Good results should be obtained from stubble treatment, but yet we have nothing out of it.

M. J. Tinline: The plot that was burnt off and put in with a drill was the best.

J. H. Grisdale: We are getting results in certain rotations but are we sure that we could not get better results in another way or would it be that a change would prove a failure? The size of the plot militates against the result. The Brandon results have been most discouraging to me, as you have had the same man in charge for a number of years, while at the other Stations every year brings a change. Brandon soil differs in texture.

W. C. McKillican: We need more check plots, a plot at the end to guard against any undue influence.

J. H. Grisdale: Could we adopt the plan of sowing the whole thing, leaving only 2 feet between the plots.

W. C. McKillican: I would suggest throwing out of Experiment No. 7.

Decided to continue for another year giving it more personal attention. (Unanimous.)

In B. C, and D in Experiment 7, plot 8 to be ploughed as other plots are ploughed.

Suggested that one of the most important things in cultural work be tried on an acre plot and see if better results could be obtained from a large area.

Discussed and Decided:—

To sow one-half acre or 1 acre of oats on fall-ploughed stubble land with a disc drill single or double, according to instructions for plots 12, 20, 21, and 22 in Section C of Experiment 10.

Saturday, January 16.—Session 9.00 to 11.00 a.m.

DISEASE-FREE POTATOES.—MR—GÜSSOW.

Mr. Güssow: Gentlemen,—I am glad of this opportunity to present to you my views on a practical method toward elimination of potato diseases prevailing in Canada. It is time to realize the importance of growing potatoes true to name, pure in variety, and free from diseases, particularly, as far

as my Division is concerned, free from diseases. We have had an example of the economic importance of potato diseases quite recently. I am referring to the American embargo, with which, no doubt, you have become more or less familiar. Here the presence of a disease prevailing in certain sections of this country, among our potatoes, resulted in the loss of a trade considered, at any rate by the Maritime Provinces, as an important and the most natural and convenient market for their product.

The question of growing disease-free potatoes can be solved. I shall explain this fully. This is as important a question to the grower as it is to the shipper and consumer. But there is another point that should at the same time receive our attention. It concerns the purity of variety, by which I mean its trueness to type and freedom from other varieties. This is a very salient feature when it concerns seed potatoes. The last factor is an equally important matter as far as the consumer is concerned. To a large extent, shippers distinguish "white potatoes," "blue potatoes," etc., and, as long as the bulk is composed of all white, the varieties composing same are lost sight of; but as far as the grower and consumer are concerned, these are very important points. The grower planting these may find different varieties in his field, one ripening early, the other late. The consumer will be annoyed at their cooking qualities—one cooking to a mash, the other remaining hard in the centre.

Hence it is our duty to encourage in Canada the production of potatoes true to name, free from other varieties, and free from disease. These three points are the essentials of profitable potato culture. Without one of these points, potatoes will not come up to the mark or compare favourably with the quality of those produced elsewhere. I do not think that the time has passed when grocers or shippers sell potatoes under two or three different varietal names out of the same bin.

I am also familiar with the practice of certain seed potato dealers, who claim to be growers, of assembling potatoes from different sources, sorting them out and afterwards selling them as home-grown stock, having no other guarantee as to purity of variety than the word of the grower, or judging by their appearance. What guarantee has a farmer, who is anxious to

grow good potatoes, that the potatoes obtained from such source are not a mixture of varieties and are free from disease, or have not been exposed to infection. The mere attaching of a certificate to such potatoes, as has been done occasionally, does not change their true character; which, as is the case with all seeds, will only appear in the field—when it is too late for registering claims.

What the farmer requires is potatoes sold to him in bags or in bulk in cars with an official certificate, stating that the consignment has been carefully inspected and consists of one named variety, and is free from disease.

If, in addition, care is exercised in grading these potatoes, and no individual tuber intended for seed purposes weighs less than two ounces and not more than eight ounces, you will agree that potatoes sold with such guarantee will be as nearly perfect as possible. I will later explain the methods of such certification.

As far as table potatoes are concerned, we should adopt similar precautions. The consumer suffers at the present time considerable losses, particularly in the larger towns and cities, from inferior quality, size, and from potatoes often considerably diseased, frozen, bruised, or otherwise unfit for table purposes.

A start in this direction has already been made this season. We have about twenty plant-disease inspectors at work inspecting and certifying potatoes that are shipped from the Maritime Provinces to the area west of the border of the province of Quebec or to the United States. This work is carried on under the Destructive Insect and Pest Act, and is primarily directed against the dissemination of the disease, Powdery Scab; but, from the definition under the Act of first grade potatoes and table potatoes, it will be seen that care is being taken otherwise to protect the farmer and consumer.

When considering the advisability and necessity of inspection, we first intended to issue a certificate for a grade that we could call "seed potatoes," but we at once realized that freedom from disease, while an important factor, was not the only factor to be taken into consideration, owing to our having no guarantee as to varietal purity and trueness. For this year, at any rate, we certify these lots as "first grade."

Requirements for such a grade are as follows: *First grade potatoes are potatoes grown on land free from infection with Potato Canker and Powdery Scab, from clean seed, have not been in contact with any source of infection, are carried in containers which have not previously held potatoes (or, in the case of cars and boats, that have been disinfected) and were inspected by a plant-disease inspector of the Dominion of Canada, and are believed by him to be free from insect pests and plant diseases.*

A tag is attached to every bag or other container, and you will grant that potatoes thus certified are likely to be better for seed than any bought without this guarantee. The method of carrying out this work with an adequate guarantee of reliability will be explained later.

Potatoes which may have been infected with Powdery Scab, but from which all infected tubers have been removed, are classed and certified as Table Potatoes. Our experience in carrying on this work soon convinced us that sometimes potatoes would be offered for shipment which, while they showed no Powdery Scab, were of such inferior quality that it almost seemed a farce to attach a Government certificate to each bag, certifying them, as it were, "fit for table use." The proper meaning of Table Potatoes was then defined under the Act as follows:—

Table potatoes are potatoes neither infected nor exposed to an infection, and potatoes which have been infected or exposed, but from which all tubers visibly infected with Powdery Scab or any disease similar to Powdery Scab have been removed, and which are of good quality, sound and otherwise fit for human consumption, which are to be used for Table Potatoes only.

This work is already being carried on, and will be continued during the summer in the fields in order to be in a position to speak authoritatively on other requirements. As regards actual experience under field conditions, I have been afforded an excellent opportunity to carry some theories into practice.

Some few years ago I had an opportunity of examining the potatoes grown on this Farm which were being used in our potato distribution. They were found to be infected with the disease "Rhizoctonia," that exists to a marked degree on this and many other farms. The question arose, whether it would be desirable to distribute potatoes so infected, or to subject

them to a treatment before sending them out. This treatment consists of soaking the tubers for three hours in a solution of perchloride of mercury 1:2000. A perfectly safe method when one can be sure that the potatoes would be planted and not, as may happen, be consumed! The perchloride of mercury is a deadly poison, and serious consequences might result from the eating of treated potatoes. It was then that I was instructed by the Director to have potatoes grown under my direction on 4 acres of land on the Central Experimental Farm. This opportunity was eagerly seized. It is always of interest to establish the practicability of one's suggestions under farm practice.

We have been using land on which, as far as known, no potatoes had been grown previously; this is one of the most desirable factors in the production of disease-free potatoes. The results of these experiments have already been published for several years in our reports—I leave it to you to pass judgment. My opinion is that these potatoes are very much better than previous crops, but this experiment brought out one important important point, viz: I do not consider the Central Experimental Farm as the best locality for growing a really first-class potato. It is not that they may not yield well, but they do not appear to have the desirable strain; owing to climatic conditions, our potatoes apparently do not absorb a sufficient amount of food to make them particularly vigorous.

As far as potatoes are concerned, we have now reached an important phase. The prevention of diseases or of the introduction of diseases prevailing in countries from which we may obtain potatoes, and which may be new in this country, yet of a serious, destructive nature, has resulted in the consideration and adoption of international legislation directed against the introduction of diseases from other countries.

We have an embargo against the whole of Europe and Newfoundland because of the Potato Canker danger, and we have restricted the importation of potatoes from the States of Maine and New York, because of Powdery Scab. And Canada was hard hit by the placing of an embargo prohibiting the exportation of potatoes to the United States.

It is the modern tendency to safeguard a country's industries by preventing and forbidding the entry from abroad of products affected with diseases. This may appear as a hardship

in the early stages, but we must already recognize in our own case the benefit to Canada resulting from the American embargo, viz.: the laws in force to prevent the spread of disease, without which it would have been most difficult to rid the country of Powdery Scab. Whatever objection there may be in the early stages, it will soon be apparent that the embargo was a blessing in disguise, resulting in an increased interest in the production of disease-free potatoes.

In order to achieve success, we must be prepared to organize a systematic inspection and adopt a standard by which to judge our potato fields and crops. The more carefully such standard is prepared, the more readily will farmers work in harmony with inspectors, and the more quickly will good results be obtained.

The question of adopting standards for seed potatoes particularly has engaged the various interested parties for a considerable time past. One country was able to make faster progress than another, due, perhaps, to the existing facilities for carrying out experimentally any such methods for the improvement of crops.

The United States deserves credit for its efforts towards standardizing requirements for seed potatoes, and I have been able to attend frequently discussions and deliberations on the subject in the United States, with a view to securing valuable information for Canada. We must bear in mind that the contiguous situation of the two countries, the close trade relations that exist now and will exist between them in the future, should be the underlying causes for the adoption of co-operative measures and standards as far as potatoes are concerned, with which my subject deals to-day.

There was recently held in Philadelphia a conference of potato experts on potato seed inspection and certification. It was not my privilege to be present at this meeting, but the spirit of co-operation which has always existed between the workers across the border and my own Division, has placed me in possession of their ideas on the question, of which I will give you a brief outline.

My own experience and the report received from the potato inspectors have amply shown that the time has come for the application of stringent measures in Canada. Reports have

been received, for instance, showing that, at any rate in one province, which claims to be exceptionally suited for potato culture, as much as from 30 to 50 per cent of the crop harvested is spoiled in storage. This is a deplorable waste of energy and of a useful product. Imagine the class of seed that will be used by the ordinary farmer, who has so much loss from storage rots in his potatoes. The question of freedom from disease, from bruises, from frozen or otherwise inferior potatoes, is most important when placing potatoes in storage. The conditions of cellars, bins, and storage houses, and the temperature, ventilation, etc., are also important factors accounting for considerable losses.

The requirements of seed potatoes would be:

1. *Varietal Certification.*—Varieties that present distinctive varietal characters shall be certified true to name. This will require field observations as to time of flowering, colour of flowers, general characters of plants and size, shape and true varietal characters of the tubers. We may find potatoes to which the same name is given, though they may differ from the type to some extent, or which are so closely allied as to be almost indistinguishable; hence we should have to adopt a description for such potatoes as belonging to the varieties composing certain groups, *i.e.*, the Cobbler Group, the Green Mountain Group, etc.

2. *Conformity to Type.*—According to certain strains within a variety, types may often vary considerably. No seed shall be considered fit for certification unless it conforms to the accepted type of that variety, in shape, colour, or other characteristics, as deep eyes, shallow eyes, etc. Climatic conditions, and maybe others, exert occasionally an influence upon varieties, causing loss of vigour or a deviation from the commonly recognized type; where such behaviour is observed in certain localities, they will not be considered as a desirable source for any such variety. Bulging at the eyes, tapering towards the eye ends and other signs indicating decline shall also disqualify for certification. If over 5 per cent of such abnormal tubers are present, the lot shall not be considered first-class seed stock.

3.—*Purity of Variety in Seed Stock.*—Seed stock should be of one variety throughout. A field containing other varie-

ties must have the same carefully removed before the crop is harvested. Fields on reinspection still containing over 5 per cent of other varieties shall not be given a certificate.

4. *Size of Seed Stock.*—The tubers contained in certified seed stock should be as uniform in size as possible. The more such stock is composed of tubers of the same size, the better will it be from the grower's point of view. Tubers should not weigh less than 2 ounces nor more than 8. All tubers above or below this size should be removed prior to certification. The inspector will soon learn to recognize the right size or weight of a suitable seed potato.

This is as far as I intend to refer to the requirements of seed potatoes in so far as varieties, purity of variety, size of tubers, etc., are concerned. Far too little attention is being paid to the question of purity of variety. Fields often show from 10 to 50 per cent mixture of other varieties. The farmers appear loath to throw them out, but it is hoped that they will realize the benefit when they find that registered seed stock will secure higher prices in the market.

I shall appreciate your constructive criticism on these points; they, are the cardinal points on which we should agree in order to set a standard.

The question, however, which naturally concerns the Botanical Division's work most is the freedom of seed potatoes from disease.

In order to grow disease-free potatoes, we must plant disease-free potatoes. But you will see that an inspector certifying potatoes to be free from disease may as well attend to the question of variety such as outlined above, and may have more success in that regard, than a person knowing varieties well, and nothing of diseases. The former knowledge is more readily gained than the latter. True, two persons may carry on inspection, one for varieties, one for diseases, but this, I think, is hardly necessary.

FREEDOM FROM DISEASE.

We have at the present moment two plant diseases affecting potatoes scheduled under our Destructive Insect and Pest Act, and one insect pest. The plant diseases are Potato Canker and Powdery Scab. The insect pest is the Potato Tuber moth.

The United States is considering Eel worm attacks as a factor disqualifying potatoes for seed stock. Neither of these insect pests has been found in Canada to my knowledge. Certification will be refused absolutely when Potato Canker or Powdery Scab occurs in the field.

In order satisfactorily and reliably to certify potatoes as to freedom from diseases, inspection must commence in the fields, as there are a number of diseases which will show up markedly in the field, such as Leaf Roll, Curly Dwarf, Mosaic disease, and a number of others, but which show no special symptoms on the tuber. Besides, certain of these diseases are more serious than others, which makes field inspection the more indispensable.

"Leaf Roll" is an example of diseases of this kind. It will be almost impossible to describe this disease to you in a manner that will enable you to recognize it. Curling or rolling up of leaves occurs in some varieties almost naturally; it may also become more prominent in dry seasons. When due to such causes, a whole field will show the affection more or less. Yet, when one finds only a limited number of plants in a field showing a typical leaf roll, a more careful examination becomes necessary. We must lift the affected plant and examine the underground stem. In many cases, we may find the main stem of the vine to be black at the base, completely destroyed and decayed. This is a sign of typical "Black Leg" disease, which is quite different from "Leaf Roll" disease. In other cases, the stem will not be wholly destroyed, but show one or more brownish lesions. This is generally a sign of Rhizoctonia. Or the rolling may be due to an attack of Fusarium Wilt, or an attack from the Potato Stem Borer. The typical Leaf Roll disease shows no decay or lesion anywhere; there may be a few tubers produced close to the underground root, or there may be none at all. At any rate, tubers resulting from a typical Leaf Roll affected plant will again produce a plant showing the same symptoms, while the yield diminishes fairly rapidly.

Another disease similar to the above is known as "Curly Dwarf." Here the plant remains dwarfed and the leaves very much curled, often forming rosette shapes.

It will be seen from the above description that only an inspector familiar with these diseases would be a proper person to inspect and certify seed potaoes.

A third disease is the so-called "Mosaic disease." It manifests itself by a peculiar mottling of the leaves, which show light and darker green areas. It is also propagated by the use of tubers produced by a diseased plant. The yield of such plants is known to suffer considerably.

The above three diseases cannot be recognized on the tuber. Hence for that reason alone seed certification should commence in the field. If a field shows more than 5 per cent of these diseases, it should not be considered fit for granting a certificate. The grower, under the direction of an expert, should remove all affected hills. If the inspector again examines the field and finds it free from the above diseases, he may give a certificate. All of these diseases are obscure, and we should not run any risks whatever with any kind of trouble that is propagated by seed.

I have already referred to the disease "Black Leg" in potatoes, as resembling "'' Leaf Roll '' to some extent, but showing the black base of the stem. This disease has been found in some provinces to prevail to an alarming extent. In one case, we have counted on a field in one row 100 plants and 200 "misses" due to " Black Leg." " Misses " from " Black Leg " occur when diseased tubers have been planted, or they may occur after a certain growth has been made, when the disease has become vigorous enough to kill the plant. Vigorous plants becoming diseased, the tubers that have already been produced will invariably be found one pulpy, putrid mass. The most dangerous stage of the disease occurs when tubers produced late in the season become only very slightly infected and are harvested. Only a very careful examination of each tuber will reveal the disease. A field showing any signs of typical " Black Leg " at the time of second inspection should not be certified for seed.

" Black Leg " is easily controlled. In our climate it does not live in the soil over winter. It may do so perhaps in milder regions, in which, fortunately, we have not found it to any extent. When cutting tubers for seed, the men should be instructed to watch carefully for any kind of discolouration in the seed tuber; they should then throw such tubers out and not

use the knife again for cutting the next tuber until it has been properly sterilized. Keep a wooden pail filled with a solution of perchloride of mercury (1:1000) handy, and instruct the men to throw the knife into it and take out one that has been in the solution for some time, and use this for cutting. In the field, every plant showing "Black Leg" should be taken up and burned.

Q. I notice New Brunswick potatoes have very little discolouration?

A. Yet they have some, and the "little" discoloration is responsible for the propagation of this disease.

Q. Will the disease remain in the cellar over winter?

A. Unless carefully picked out, the disease will produce a storage rot, particularly in damp, warm cellars.

Q. Why does it not spread through the whole stock?

A. The rate of spreading will depend upon the temperature prevailing in the cellar. The temperature should not rise above 40° F., and never below 32° F. A few degrees of frost will affect the taste of the potato, making it disagreeably sweet and soapy. Potatoes should not be kept in bags, nor should they be in large heaps unless the ventilation is specially good. If the temperature rises above 40°, the losses from all sorts of storage rots will be considerable. In low temperatures, micro-organisms do not develop.

Q. Referring to seed potatoes in New Brunswick or other places, you would have to protest against any great increase in disease when the potatoes are in storage. As far as "Black Leg" is concerned, it seems to be a more seasonal thing than due to seed.

A. If it is not in the seed it will not appear in the field; it matters not whether you may have a favourable or unfavourable season.

The fact is that farmers know very little about this disease; hence, having appeared in the field, it will be propagated rapidly by the use of diseased seed tubers. It is not my desire to have this inspection carried on by farmers or by Superintendents of our Farm system, but this Division will take care of it. It would, however, be most desirable to have farmers and Superintendents present when the inspection is being made, as this will be a useful demonstration, and will enable them to recognize these diseases very readily. This is what we most desire.

FUSARIUM WILT.

In the tuber, the disease manifests itself readily when cutting off a slice at the stem end; when present, several isolated brown spots may appear in the region of the vascular bundles, or the whole vascular bundle may be discoloured deep brown. In the field, affected hills appear to wilt; when, taking a sharp knife and making a slanting cut through the green part of the stem, the vascular bundles will appear brown, but the stem may not show any external symptoms.

All such plants should be promptly removed. Fields showing over 5 per cent of wilt at the second inspection would be disqualified unless such plants are at once removed. The presence of 5 per cent or more tubers showing disease after harvest would disqualify for a certificate.

RHIZOCTONIA.

Diseased hills showing rolling of leaves or serial tubers, should be removed at the time of the first inspection. The presence of 5 per cent affected hills at the time of the second inspection should disqualify the potatoes for seed certification. On the tubers, the presence of sclerotia should be referred to in the certificate. All tubers showing many or large masses of sclerotia should be removed. The advisability of treating certified tubers should be noted on the certificate.

Q. Does not Rhizoctonia also cause misses in the field to which you have already referred?

A. Actual misses occur rarely. They——

Q. Supposing the plant, just as it started, is attacked by Rhizoctonia?

A. This will happen in most cases when, for some reason or other, the young sprouts are prevented from breaking through the surface of the ground. The period for them to remain below ground would be unnaturally prolonged and the Rhizoctonia mycelium may attack the sprouts and kill them off before they appear; this will cause a "miss."

Q. Is it true that misses are due to Rhizoctonia?

A. In such cases as I have already referred to. Generally speaking, they are more likely due to Black Leg or, in some cases, to none having been planted. The planter may have missed.

Q. How can you distinguish Black Leg and Rhizoctonia misses?

A. By taking up the parent tuber. In Rhizoctonia cases, the tuber does not so readily decay. However, there will be no difficulty in distinguishing these misses, because, if due to Black Leg, there will be plenty of hills showing unmistakable signs.

Q. How do you treat for Rhizoctonia?

A. We have been rather successful in our experiments by treating for three hours with perchloride of mercury. We have tried to skip a year when the tubers were fairly free from sclerotia, but we found it necessary to treat them every year. It is more difficult to escape infection carried in the soil. Rotation seems the only practical proceeding.

Q. I received five samples of potatoes from Ottawa, and there was not one plant that was not diseased. Why?

A. I cannot say what varieties you got from Ottawa.

Q. One variety has blue stripes.

Mr. MACOUN: Mr. Clark has some of our varieties. We have found that Ottawa seed is not very satisfactory. In eastern Ontario and certain parts of Quebec, the summers are so dry that potato vines ripen prematurely when the tubers are still growing. Down in the Maritime Provinces, the vines remain green much longer. In the Prairie Provinces, the yield is 500 to 600 bushels per acre. We have grown here varieties from the Old Country, but, when sending them out to the Northwest, they have not done well.

REMARK: Potatoes grown in the state of Maine are highly recommended.

Mr. MACOUN: This is due to the climate being very much like Nova Scotia and New Brunswick. I know it is a very well recognized fact in the Old Country that potatoes that mature well will give far bigger crops than where tops die off.

Mr. GÜSSOW: If I receive the authorization of the Director, the Division will carry out examination and inspection of potatoes at the various Farms in the Maritime Provinces. As soon as we have produced seed worthy of propagation, we can continue growing them, and have first-class stock for distribution, subject of course, to field inspection as outlined above. If we carefully and systematically carry on this work, we must

reach the end in view, *i.e.*, increased production due to freedom from disease and superior grade of potatoes planted.

Mr. GRISDALE: I think the discussion has been exceedingly opportune. The question of producing good seed potatoes is most important. We are in a life-and-death struggle. I think what the Superintendents of our Farms can do in the eradication of these diseases is exceedingly necessary, and anything that we can do co-operatively we should do, and I shall authorize any necessary expenditure to have it done. When we undertake to do it at any one of these Farms, it wants to be done thoroughly. We have been for three years working on 4-acre plots to see what we could do. Mr. Güssow directed the work, and has suggested and carried on treatment for diseases. I have not gone over every row, but what I have seen were certainly very clean and fine potatoes. I really don't want to hear any more like this discussion about the condition of potatoes going out, as indicated by Mr. Clark. You have had every opportunity for taking every precaution against disease. As regards eradication of disease, it must be done. We must stop the growing of disease-infested tubers on the Central Experimental Farm or on any of our branch Farms. The great nation to the south of us is trying to make the most of one of the diseases that we have, with a view to keeping out our potatoes, and we must do something as a system; if we neglect our opportunities, we are falling down in this line. If we cannot do better than such a report as Mr. Clark's would indicate, we shall have to discontinue growing potatoes on the Central Farm at least, and grow grain.

Mr. MACOUN: I would like to point out that the potatoes were treated for Rhizoctonia, as Mr. Güssow recommends, and Mr. Clark says they were treated again. Nothing more could be done on our part, as the disease remains in the soil six years.

Mr. CLARK: The disease cannot have been in the soil, because I grew potatoes of the same variety of my own production side by side with those from Ottawa. Mine yielded 600 bushels per acre. Those from Mr. Macoun only some 6 bushels. I treated them before planting.

Mr. GRISDALE: If treated according to instructions and no improvement results, then it is time for a change of method of treatment.

Mr. Güssow: I have treated the potatoes on this Farm, that is to say, those I grew, and they were quite satisfactory. I found the treatment very efficient. How does Mr. Clark know the failure of Ottawa seed was due to Rhizoctonia and to nothing else?

Mr. Macoun: The seed from this part of the country is not vigorous.

Mr. Grisdale: Would it be possible to set apart land at one of these Farms where seed can be grown, for instance, Fredericton or Charlottetown, and, from that part, distribute seed to other parts of Canada? Mr. Macoun has secured a large selection of pure varieties and, if we can't propagate them now, either because of their diseased condition or inability to throw off disease when they go to other parts, then we had better have a specialist. New Brunswick is already recognized as a great potato-growing province. How would it be to carry on the work there? We have a large area of land there, and we might make a specialty of potato-growing on that Farm. It would provide us with seed for Canada, and it would also serve as an excellent example to the New Brunswick potato grower as to how to proceed to eradicate disease and keep the crop free from disease.

Mr. Güssow: I think it would be most desirable to do that, because Rhizoctonia will, no doubt, be on the Central Experimental Farm as long as the Farm exists. Your remarks in some way affected Mr. Macoun, Mr. Macoun's remarks affected me, and my remarks will probably affect Mr. Clark. My remarks are not intended to reflect upon any person particularly. I have never heard in all the experience I have had with Rhizoctonia that there ever occurred such an enormous decrease in yield due to that disease. I do not think that that is due to the disease at all. We have grown varieties of potatoes at the Central Experimental Farm, but the strain may have run out. I know that there are the climatic conditions which we cannot remedy, so that I agree with Mr. Grisdale that the Central Experimental Farm's situation is not suited to produce the best potatoes. That can easily be accomplished in New Brunswick. I have seen in New Brunswick some fields that were absolutely perfect as regards the growing of potatoes. The yield was uniform and even, and, with a little care and the

exercise of selection in the field and after harvest, I am quite confident that we will succeed in getting a potato that will be very desirable to have.

Mr. CLARK: I know that the yield, the lowest, was correct. I got about 600 bushels per acre for the same variety grown from my own seed.

Mr. MACOUN: I have been trying varieties from different sources for a good many years, and if you will look up my report for 1910 you will find the most striking illustrations. We have had over 400 bushels per acre from Indian Head seed and 50 bushels from Ottawa seed.

Mr. CLARK: I want to say that I grew the seed in Charlottetown; it was then sent to Ottawa for identification, was grown one year and came back again, when it did not resemble the MacIntyre at all.

Mr. GÜSSOW: Was the MacIntyre infected with Rhizoctonia?

A. I believe some were. I have a photograph showing the MacIntyre that came back from Ottawa, and those grown in Charlottetown, and there was a decided difference.

Mr. GRISDALE: I believe Ottawa is not the best Farm to carry on this work, and I am not so sure that it was due to disease now that Mr. Clark has modified and qualified his statement, but his first statement was certainly something to sit up and take notice about, and I am sorry to think that we were carrying on such experiments as would lead to results as secured by Mr. Clark. I am going to start over right now and say it is time to make a change. If we cannot produce potatoes at their best here (because it is when they are at their best that they can be selected for variety), I will say this, that I think we should carry on our selecting and our propagating work some place in our system where it can be done to the best advantage and most effectively. Now, to attempt to grow Indian corn at Ste. Anne de la Pocatiere with a view to improving strains, would be absolute nonsense. The same criticism would appear to apply to growing potatoes at Ottawa when the object is to get varieties true to type; hence I think it is time for a change. So far as the eastern Farms are concerned, the seed could go from there to other Farms. We don't want, however, to undertake breeding work at two or three points. Mr. Macoun has

carried on a lot of these experiments, comparing the seed, etc. I think the work of propagating these varieties should be done at some point under good potato-growing conditions. We are spoiling the reputation of our field crop returns at the Farm here.

Mr. Güssow: Mr. Grisdale, would it not be possible to begin this work during the coming season? It seems to me that it would be desirable to produce the first generation at Fredericton, then distribute the seed from Fredericton to all the other Farms. The potatoes should be grown at Fredericton on a proper system, and carefully inspected there before they are sent out anywhere else, for freedom from disease. This inspection for disease should again be carefully made at each Farm where potatoes are grown for multiplication from seed sent from Fredericton. All the Farms would get their seed from New Brunswick. When the potatoes are grown in Fredericton under strict supervision, freedom from diseases could almost be guaranteed. The inspection would, of course, be carried on by a man possessing the requisite knowledge of plant pathology.

The discussion on Rhizoctonia has led us away from our main subject, to which I desire to return for a few more moments. It is often the case that several of the diseases referred to may already be present in a field. Where this is the case, the inspector should not issue a certificate at the final inspection, when more than 5 per cent of them are found. A 10 per cent limit would be allowed for all diseases combined. No certificate would be granted if more than 10 per cent of hills are affected by the above-named serious diseases, and by the less important ones following here.

COMMON SCAB.

The presence of Common Scab in a lot of potatoes offered for seed certification does not disqualify them. It will, however, be stated in the certificate. All infected tubers should be removed by the grower before certificates will be granted. If more than 10 per cent of affected tubers remain, the potatoes should be racked over again and the tubers showing Common Scab be removed.

Q. Have you any satisfactory treatment for Common Scab?

A. No, not yet. We have carried out quite a number of experiments. We have very noticeably reduced the amount

of infection by treating the tubers with perchloride of mercury, the 1: 2000 solution, acting for three hours. But we have not found that any treatment will absolutely control the disease. This is due to the soil in some instances; in others, to the use of stable manure. Artificial fertilizer does not seem to produce so many scabby tubers. At any rate, freedom of the seed tubers from scab is the most desirable and essential point.

SILVER SCUFF.

This disease would not disqualify seed stock for certification. It should be stated on the certificate, and tubers found badly covered with this scurf be removed.

INTERNAL DISCOLORATIONS.

All kinds of internal discolorations, streak or net necrosis, brown spot, black spot, would disqualify potatoes for seed certification if present more than 10 per cent in any sample taken at random. They would be reported in the certificate.

LATE BLIGHT.

If Late Blight is noticed in a field on inspecting same, it should be stated on the certificate. All tubers showing Late Blight spots to be removed before a certificate would be issued.

STORAGE ROTS

The presence of any dry rots should be reported in the certificate. The grower should remove all showing any sign of rot before shipping.

MINOR AND OBSCURE DISEASES.

There may appear diseases in potato fields that have not been included in this list. It would be left to the inspector to decide whether the removal of diseased hills or disqualification of stock for seed would be more advisable.

I have endeavoured to explain to you in the foregoing, the system which, in my opinion, should be inaugurated in connection with the supply of first-class seed potatoes. I shall be glad if you will give me your opinions, because only a thorough discussion of the various phases touched, will finally

lead to the adoption of a satisfactory standard. The Experimental Farms should produce potatoes according to the highest standards, and we should be able to practically guarantee the seed distributed to the farmers. In this way, we should bring potatoes up to that high standard we are now enjoying with grain.

The whole case in a nutshell is simply this: We shall begin with the best seeds, have them examined before planting by an officer of my Division, and have the same planted and grown in, say, Charlottetown, Fredericton, and perhaps Kentville, and on one of our Farms in Quebec, according to the most improved methods. During the period of growth, when the potatoes are in bloom, the first inspection will be made and the various rules concerning diseases, misses, etc., carefully carried out. Later in the season, before the foliage has died down or has been touched by frost, a second examination will be made for Late Blight, and yield, and presence of tuber diseases. The harvest will then be judged according to the above standard and the potatoes kept in a separate bin in storage. Potatoes thus inspected will go to the various Farms and Stations, and the same inspection will be carried out on these Farms every year. Systematic change of seed at such centres will be arranged for, the seed being regularly produced on the Maritime Farms. The branches west of the Maritime Provinces would then be in a position to send out a first-class stock to farmers in their districts.

The same method of procedure will be followed on the fields of any farmer who registers with the Dominion Botanist for seed potato certification. It might be advisable to charge a fee to farmers for every variety thus inspected, but that will be subject to further consideration.

Full instructions will be prepared and furnished to the various Superintendents on whose Farms potatoes will be grown.

If every one of us will take a little interest in this matter, the results to be expected from such work are obvious.

Mr. GRISDALE: The time asked for by Mr. Güssow for the discussion of his subject was one-half hour. I gave him one, and he has taken up two hours. I think the discussion must close now, as we have another subject for this morning.

NOTE.—See also under Part III, Special Articles, "Rules for Disease Elimination."

Saturday January 16. Session 11.00 to 12.30.

ANIMAL HUSBANDRY.—MR. ARCHIBALD.

Mr. ARCHIBALD: There are a few phases of this work which may apply in a general way to all of our Farms, and there are, no doubt, a great many details which cannot apply to some of them. Some of you have no buildings on your Farms, others are partially equipped, and some of you have your Farms already fairly well stocked. That brings up the point "How much stock can we possibly keep on all our Farms?" I think that the best plan is to stock up as heavily as possible. That has been the policy of the Central Experimental Farm. A very interesting experiment was carried out at this Farm by Dr. J. Robertson, and you will see in the annual reports that each year he was able to keep more stock on the 200-acre farm, due largely, I think, to his increased yields of roughage. We should plan in our live-stock work to grow all the roughage possible, and we should stock our Farms up to the limit of this roughage. That of course, would be more stock per acre than you could hope to keep if you were planning to raise all the feed on the Farm. To some of you who are just getting the land cleared that, of course, means a very small head of stock. After holding a few meetings throughout Eastern Canada I find the question: "How much stock can we keep per acre on our farms?" a pertinent one. This year especially, I think it a good thing to keep this point in view throughout our work.

There are quite a number of phases of our work along lines of that kind which I know you have in mind, and I should like to mention a few of the points which have occurred to me. As we go round each of our provinces we should study as much as possible the individual needs of the farmers along livestock lines. Some districts are very much antiquated in their methods of feeding, others in their breeding, and if we study these as most of you already are doing we can undoubtedly plan lines of work of which at the present time we are scarcely thinking. Co-operation with the farmers is absolutely essential in our live-stock work.

After several years' work, you may have variations due to one reason or another which almost upset your work. You must have the average of a great many years in order to satisfy

yourselves that the results are definite. If we could, by co-operation, have somewhat the same methods followed by a large number of our farmers, the data then would be more reliable, and we would be covering eight or ten times as much ground per annum. Those of you who are dealing particularly with dairy cattle could probably do a great deal to assist the farmers if you would, in your meetings, try to bring up the idea of milk records, for example. Milk records have been distributed free of charge for a number of years. We have a number of forms for recording milk produced and feeds consumed. We have been advocating this method for a number of years with the farmers but have had indifferent success. A large amount of this work has been done by the Cow-Testing Association of the Dairy Division, but our work in no way interferes with theirs.

Could we, with some sort of a co-operative campaign, get in touch with the individual farmer's work? You are keeping milk records all the time; do you not think that we could get the farmers more interested in the same?

There are other points in this co-operative work, for example, co-operative breeding; that is, community breeding. If we can superintend the work of any co-operative association or organization among the farmers of any community, we will do a vast amount of good.

Mr. Hutton: In the matter of co-operative work with the farmers: We could not expect the farmers to carry on experimental work in one sense, that is, we could not expect them to carry on a losing experiment. You mean to co-operate with them in getting a record that in contrast with yours may indicate the best method for them?

Mr. Archibald: Of course we could not expect the farmer to experiment with loss to himself. You probably are one of the few farmers who have a silo on your farm in your district, and I think you are one of the few who have ensilage this year. The farmer who is willing to put up a silo if it is demonstrated to be advisable, is not uncommon, but you would not find a community willing to do that. We might by co-operation obtain results as to comparative values of ensilage *versus* green feed.

Mr. Hutton: I should not expect him to be willing to continue it after it did not pay him.

Mr. ARCHIBALD: If you have a number of farmers in one district working on the same thing, in less than one year you have something more definite than with just your own experiments. I just mentioned that as a possible means of getting in touch with the farmer, a possible method of increasing production and of getting farmers to take more interest in the work which you are doing.

I don't know just how many of the detailed things which are more or less pertinent to us all we should go into this morning, as we can talk over the details as we are going round the live stock and buildings.

Have any of you any suggestions regarding the question of co-operative movement along livestock lines?

Q. How are we going to get out and see these farmers? Under my conditions it would be impossible.

Mr. ARCHIBALD: I realize, gentlemen, that you have such a diversity of work that you cannot follow up the details of any one line. Nevertheless, when we have the time it would be a possible source of good work.

Do you not think that we should lay particular stress on the costs along live-stock lines? For instance, in our annual reports, the receipts for dairy cattle or beef cattle should be put out on a balance sheet form. I think this would draw the attention of the farmer. Should we not each and all give particular attention to this cost of production, either of the animals or of the animal product, such as milk? I think that a great deal of care should be taken in the publication of our results and they should not be published too soon.

Q. Where you have not very large buildings, and where the work is out of proportion, are you going to debit the stock?

Mr. ARCHIBALD: I think it is better to say nothing about it. As a farmer, you ought to know about what number of men should look after stock. When we are carrying on experimental work and are keeping the buildings in such shape that they can be inspected, and inspected by a man who goes away satisfied with them, some extra labour has to be employed. We cannot expect a farmer to keep his buildings the way we do. It is sufficient when the cattle are kept moderately clean and comfortable, and the stables fairly clean; that is all that can be expected from the farmer. We, however, must keep everything

absolutely clean and in shipshape; that is work which we cannot avoid. You must eliminate that in your costs of production.

Q. Is it an honest balance sheet to report?

Mr. ARCHIBALD: That money was not spent on live stock, was it? It was spent on keeping the stable extraordinarily clean; I don't see how you can say that it should be debited to the live stock.

Q. It would depend on the accuracy of the judgment of the man who made these estimates. You take a bunch of steers in the way Mr. Hutton is feeding his outside steers; every hour of labour should be debited against them.

Q. I don't think that every dollar of labour should be debited against the cattle in a stable such as Mr. Hutton has.

Q. We have quite a bit of additional expense. Is not the purpose of showing the cost of production shown better by showing the costs of different types of animals worked out separately?

Q. Would you make the whole thing just a financial statement, showing, say, dairy cattle? If you take off the amount of extra labour which has been put on for either experimental or some other purpose, and put the rest on a straight commercial basis, it should show a profit if the cows are good.

Q. Is it only a guess after all? I don't see why you cannot tell, because if you have a herd of dairy cows and a certain number of young stock and bulls, and if you add one or two men in order to produce certified milk, or something similar, you have got a basis for a correct statement.

Mr. GRISDALE: When I was running the live stock here I went over the thing very carefully, and decided that it took about 15 per cent more labour, and I therefore cut off that much. That is, I said: This number of men would do the work and do it better than the average farmer would do it. There are a lot of extra jobs which we must look after, such as dusting and cleaning out little corners and looking after things that must be done if we are going to let our Farms have a good reputation. There is no profit in them, except the profit of a good reputation.

I tried to do it this way. If you wanted to be absolutely frank with the public, you could say that to handle this herd under experimental conditions costs so much. We have experi-

mented and found out that it takes about one extra man to look after things and keep them right.

Mr. ARCHIBALD: I would be the last man to deceive the public in any way, but to tell a man that a good dairy herd would cost a thousand dollars for labour when in reality it costs eight hundred dollars, if you take off the extra labour, would be misleading.

Mr. MOORE I think that that is the most valuable part of your work. You can itemize each of those herds in your statement. At Agassiz we have also two classes of live-stock.

In some districts would it not be possible to find out that one man could handle so many cattle and their progeny, and get a fairly good idea that way how many men could handle our herds as a commercial proposition?

A SUPERINTENDENT: Before I was connected with the Farm system in any way, the one thing which I resented when I read the annual report was that the question of labour was not handled properly. Labour is a controlling factor all the way through. Labour was our main item of expense out West, because grain was plentiful.

Mr. ARCHIBALD: The more we can bring down the cost, the more we shall improve our work; that is why I brought up the point. We are getting down to the farmer's basis of cost.

Mr. HUTTON: I think that the question of cost is of no vital importance in our work with steers. We have always neglected the labour. We have had two or three criticisms because we have always neglected labour, but we have been able to answer them by saying that there are different conditions for different farmers. We simply neglect labour, but give a statement apart from that. Our values, for instance, vary. We charge, for instance, $10 per ton for pure green feed. It sometimes happens that it is much cheaper, so that we state the number of pounds consumed and neglect the labour that they might do in feeding. This system would not do in dairy work. We also show how many pounds of manure we are producing.

Mr. ARCHIBALD: Well, here is the point, gentlemen. If you were at a meeting and somebody asked you: "How much does it cost to produce 100 pounds of milk?" what would you say?

A SUPERINTENDENT: I would tell him.

Mr. ARCHIBALD: Well, tell me now.

The SAME: I cannot tell you now, but if I had time to figure I could tell you.

Mr. ARCHIBALD: We should try to induce the farmers to put their live-stock work on a careful basis and figure in all the items.

Q. I have not made many experiments with my stock, but cannot the feed per head be applied to production with regard to live-stock?

Mr. GRISDALE: I presume that you keep the same data with regard to live-stock as you do to other lines. I presume that all of you keep details of the distribution of labour on your Farms, and also with regard to horse labour?

Q. Suppose that I have to haul hay three miles?

Mr. GRISDALE: That goes on the cost of your hay.

Q. What about the fellows up in our country who have to haul their water for domestic purposes 10 miles?

Q. What if you have to lead your horses to pasture three-quarters of a mile distant?

Mr. GRISDALE: You must not debit your experimental work with leading horses three-quarters of a mile.

Q. No, I shouldn't think so.

Mr. HUBBARD: It is a cooked-up balance sheet, and I should not like to publish that kind.

Q. How are you going to come to a decision if you use the milk alone as a basis?

Mr. GRISDALE: If you sell ten bulls, there is $1,000 to credit to your herd.

Q. Well, but what if you have no bulls to sell?

Mr. GRISDALE: If you have eight heifers valued at $100 each; in other words, you have got to take stock at the end of the year.

Q. I don't think a compulsory balance sheet from all the farmers would be advisable.

Mr. GRISDALE: I am not asking for a balance sheet, or anything, but it is a good thing to consider. But it might be better to go on thinking about it for a while and change the subject: if a man has a balance sheet that is any good, give it out! While there are some live-stock balance sheets in this system of Farms which are pretty good, there are some which are pretty bad.

Before leaving this question, what about horses? How about a balance sheet for horses?

A SUPERINTENDENT: Impossible! I think that with any other stock you can keep a balance sheet, but with horses it is impossible.

Mr. GRISDALE: On the contrary, I think it quite practicable, debit each division such as horticulture, cereals, etc., with so many days' work. We keep a record of every hour's work that is done here. In fact I think it is published here each year.

Q. Would you not have a loss of labour made by travelling from one part to another in experimental work?

Mr. GRISDALE: What we have done here was: Suppose a horse was changed from one part of the Farm to another, we just took that space of time off. You take the way we treat horse labour here: we debit the Division for the horses they get. Supposing the Horticultural Division gets a team, we debit them with two horses for a day, so that the horse gets the full credit, and the same way with the other Divisions.

Q. What about the horses when they are resting?

Mr. GRISDALE: Well, if they are idle while supposed to be working for some Division we give them credit for that time. There are frequently teams in the barn getting credit for a day's labour, while doing nothing. The Division loses the labour, it is against the Division, not against the horse. If the horse stays in the stable a day he is in better form to work to-morrow than the horse that works every day. Of course, with the average run of the horses, if they do not work they do not get anything. The Horticultural Division and Cereal Division, etc., have each a team during the whole year. I have had to settle half-a-dozen disputes over that very thing. The team is supposed to be working, and we should have it work all the time if they did not come in and say: we want that team reserved for us.

Q. How is their balance sheet going to work out?

Mr. GRISDALE: I do not know whether they publish a balance sheet. There are so many little jobs it would be impossible. They are trying a thousand varieties of vegetables, and probably get a dollar from them, so that there is no return. It seems to me, however, that some such system is the only

one to follow to be fair to the horses. If a Division has the right to a team and will not let it go to any one else, the horses should be credited.

Q. We could never try to imitate conditions here in trying to figure up the cost of horse labour.

Mr. GRISDALE: You do not work it that way, but here where everything is so complicated, we have to.

A SUPERINTENDENT: One point that I am trying to puzzle out now is: We give a teamster ten hours a day, and to get at the cost of labour we must allow so much for care and so much for farm labour.

Mr. GRISDALE: The way we work it here is to allow so much for the horse and so much for the man while working. Did we not agree how much should be charged for horse labour, etc., in connection with rotation work? Driving a team goes against the land, care of the horse goes against or on the debit side of the horse account.

Q. In the prairie we have some of those items wrong. For instance, the cost of threshing, etc.

Mr. GRISDALE: Of course, I suppose that the cost of threshing has risen in the past five or six years.

A SUPERINTENDENT: It has lowered with us.

Mr. GRISDALE: This scale was agreed upon or discussed by you. It is a sort of average. It was discussed and fixed upon just to have a fixed statement to use so that experimental work might be uniform. We must know exactly what the item of the cost of horse labour is, what the keep of the horse will amount to, to get the cost of keeping the horse separated from that of attending the horse by the man who is trying to make him produce.

Mr. ARCHIBALD: We take the total cost and divide it by the number of horses. We take feeds at the market prices or the prices mentioned in the report, and take the amount of labour in the same way. We have a special man to look after the horses. I do not think we can hope to get the most out of our horses until we have a special man, which means more correct feeding. It means a saving of feed, and it means less disease among the horses. If you have a separate barn for horses I think you could use a man's time quite largely for looking after the horses. The man is expected to keep the horses clean, keep all the

machines ready to go out to work, sharpen the sickles, etc. You get a man fitted for that type of work and it will be all right. We weigh everything as it comes into the barn, and this man can do that work too; each teamster keeps his own team, and all teamsters are paid for eleven hours, that is, we pay for ten hours for the work outside and one hour inside. Besides this they get a higher rate per hour than other men.

A SUPERINTENDENT: Ours is a combination of the two systems.

A SUPERINTENDENT: The reason I thought we should have a special rate is that we must keep our teams well groomed.

Mr. GRISDALE: We consider that a man who is a good teamster is worth more than the average labourer. We have one man whom we regard as a kind of head teamster and he gets a cent an hour more than the rest.

Mr. ARCHIBALD: Well, gentlemen, there are a good many other points which we could discuss. There is the old question of laying out experiments for a number of years, that is: working up our policy of feeding and breeding, particularly our experimental work for some years to come. That is a point which we have discussed individually from time to time; we cannot go into the details of this at present.

Mr. GRISDALE: Well, suppose, Mr. Archibald, that we spend the rest of the period in considering where certain lines of work should be carried on, and what correlation should exist between the similar lines of work carried on at different Stations of the system.

For instance, we are doing dairy work here, also at Nappan, Ste. Anne de la Pocatière, Cap Rouge, Fredericton, Lacombe, and at Agassiz. We are doing what you might call purely dairy work at these Stations. Would it not be advisable for those Superintendents and yourself and myself to discuss the lines of work that we should carry on?

Q. That would be the fundamental lines?

Mr. GRISDALE: It seems to me that we should have more correlation in our work. Mr. Hubbard is carrying on a line of work quite regardless of what Mr. Moore is doing; he is working away in his own line. Now, I think that he should be thinking somewhat more of what Mr. Moore is doing and of the results Mr. Moore is securing. I think that we should have

more team work, that is, that any one important line of work should not be carried on at any one Station alone. To illustrate: at Nappan we started an interesting breeding experiment a few years ago with dairy cattle, and we have more recently started something similar at St. Anne and Cap Rouge. Have we not the same thing exactly at Ste. Anne and Fredericton?

Mr. ARCHIBALD: We have the same thing exactly at Fredericton as at St. Anne.

Mr. GRISDALE: Now, then, at Agassiz and at Lacombe I suppose we could say we have another line. There have been, there are thus, some regular lines of work under way, but I would like to have much more correlation and co-ordination than there have been in the past. There is, of course, the question of how much or how little can be done at each Farm and what we should consider our maximum in the way of herds of cattle (beef and dairy), sheep, swine, etc. It seems to me, however, that to get perfect co-ordination we must get expressions of ideas and opinions from our Superintendents when planning this work, and not merely criticism after the work is planned. As officers more or less closely in touch with matters agricultural in all parts of the Dominion, Mr. Archibald and myself may be expected to have some ideas about the work to be undertaken, the expansion that is necessary in live-stock lines, but we want your ideas too, for the reason that you should know more about the local requirements than we.

Mr. ARCHIBALD: I think that is the most important thing of the whole: How much correlation can we get in all of these things? I think the only way is to get a uniform level. Some men will have to let go something and take on something and not make the one solitary feature he is interested in the all-important thing.

There is another point which I think it would be well to take up. It has always appealed to me, at least, for every Farm to have a specialty, some particular line of work in which they shine.

Q. That is, just something that keeps you going?

Mr. ARCHIBALD: There are not very many farms on which that exists; most of the Farms which have live stock are doing general work. There are one or two Farms which have a specialty —for instance, Brandon and Kentville, and also Ste. Anne de la

Pocatière. The same at Indian Head. Now there is a special line which is unique, and where there is a distinct objective; it is not an easy one, but it is an exceedingly important one. Some of the farmers have two or three experiments with cattle, and I think we should make a specialty of one particular experiment. Let the breed which is specialized in be the most suitable for that district.

For example, one phase of our live-stock breeding work is the distribution of pure-bred stock at a reasonable price. If we distribute Guernsey bulls at any figure in an Ayrshire district, I do not think we are doing the breed any good, or *vice versa*, as the case may be.

A SUPERINTENDENT: I do not think it is wise to specialize on any one line in breeding.

Mr. ARCHIBALD: I think that, if we have two or three breeds, if we find it is the wrong line for the district we can nullify it later. At Fredericton we have two dairy breeeds and the dual-purpose cow. If we considered the Ayrshire the more suitable cow I think we should choose the Ayrshire breed. I think you would not get as good results from a mixture of the breeds as from one breed in experimental results, but that is a difficulty under which we must continue to work.

Mr. GRISDALE: If you keep one or two breeds upon the branch Farms, I do not think there will be very much objection. No province expects any Farm to keep all the breeds. If you take the cattle at Manitoba College, including small herds of four breeds, with three or four head in some of them, what can be done in an experimental way or in the way of breeding either? Absolutely nothing, in my opinion. It is, however, necessary to keep these herds there as specimens for the students to work over. If you get data from the one-breed herd at Brandon it is valuable over the whole world.

Mr. ARCHIBALD: We want something that is worth while in the way of getting results. It is not so much the running of one herd against the other.

Mr. GRISDALE: I think the running of one breed against another the biggest mistake in the world.

A SUPERINTENDENT: You do not compare the results yourself, you let the other man compare them?

Mr. ARCHIBALD: We arrange the breeds alphabetically in the report for diplomacy's sake.

Mr. HUTTON: Well, speaking for Lacombe, I would not know what breed we should like to specialize in; we have a beef breed, and I hope to make that first-class.

Mr. ARCHIBALD: Well, I am not speaking of the beef breeds merely.

Mr. HUTTON: Of the dairy breeds we have a few, just a few, Jerseys. This experiment will be a very important one. That is, the one which we are carrying on with three herds of Holsteins.

A SUPERINTENDENT: You mean you hope it will be a very important one.

Mr. HUTTON: Well, if it does not come out the way we hope, it will be the worst thing that ever happened to Alberta. We have three herds now started. One a common herd, one a high-grade herd and one a pure-bred herd. The common herd's experiment is practically completed. It amounts to over 5,000 pounds milk yield per cow.

The high grade herd of Holsteins which were not re-bred to come in as quickly as they will next time, milked 344 days with 25 pounds average per day. Total milk produced, 8,649 pounds per cow.

The pure-bred herd up to December 31: One cow went dry with about 7,000 pounds of milk produced; the herd produced 7,905 pounds of milk each, or an average of 35 pounds of milk per day.

The common herd we hope to bring up to the results we are getting with the high-grade herd. In all our experiments, the absolute necessity is shown of getting a good bull, but a man will sometimes strike a wrong one, even with the best of care.

Mr. GRISDALE: I think that the lines which Mr. Hutton is working on are excellent. Mr. Baird, you might tell us something about your experiences.

Mr. BAIRD: We started out in 1911 with common grade cows of the country there, and bred them when a year old to an Ayrshire bull, and next year bred those same cows to a Holstein bull, and the following year to a Guernsey. The first year we got eleven heifers from them, and these

were bred to a pure-bred Ayrshire bull from which there were six heifers. With the exception of three or four, all the heifers are doing better at the present time than their dams. The Holstein heifers are really magnificent heifers; they are showing their sire's prepotency. We are getting the best bulls we can from a production standpoint, working on production straight through.

We are duplicating our work, starting from 1911. That is, doing it all over again. We will have two crops of Ayrshires, two of Holsteins, and two of Guernseys. This year we have had seven calves dropped and five have been bulls.

Mr. GRISDALE: Well, now, both Mr. Hutton and Mr. Baird are working along the lines of demonstrating the value of a pure-bred sire. They are working with the same object in view, but one is specializing in Holsteins and the other in all three breeds. He is giving them equal chances.

Mr. ARCHIBALD: Mr. Baird's is a much more extensive experiment, it will take him years longer. Mr. Hubbard, you have three breeds doing the same as Mr. Baird; yours would be Holsteins, Ayrshires, and Shorthorns, and then repeated.

Mr. GRISDALE: In the four herds we have the question of grading up well illustrated, that is, in the five herds we have met one specializing in Holsteins, two in Ayrshires, and two Farms where they are trying three breeds.

Mr. ARCHIBALD: It is just a question whether it is worth while doing anything more on that line.

(Adjourned for luncheon.)

Saturday, January 16, 1915, Evening Session.

After a preliminary meeting of the Superintendents, the regular session opened at 9.10 p.m., all the Superintendents being present except Mr. Langelier. From the Central Farm, there were present Dr. Shutt, Dr. Saunders, Dr. Malte, Mr. Güssow, Mr. Macoun, Mr. Sladen, Mr. Archibald, and Mr. Elford.

The Director, Mr. J. H. Grisdale, presided.

Mr. GRISDALE: Gentlemen, you are aware that the principal object of this meeting is to give you, as Superintendents, an

opportunity of discussing matters with the Central Farm officers, either as a whole or as individuals, or with me as Director. If you have anything you wish to take up, now is the time to present it.

Mr. HUTTON: Mr. Grisdale, a meeting was held by the Superintendents on Thursday evening, as suggested by you. The meeting lasted for some time and, after considerable discussion, the results of our deliberations were framed as resolutions, which I will present in the order in which the subjects were taken up by us. The first resolution is as follows:—

> That we request the Director to arrange with the officer in charge of distribution that the various Superintendents be supplied with the mailing lists now filed for the province in which each Farm is located, and that all applications sent by each Superintendent shall be filled, and all names sent by him shall be added to the list for all reports or for special reports; and further, that the Superintendents shall each receive all departmental publications.

In explanation of this, I would say that, to give an instance, I, and perhaps others, received a number of inquiries *re* the recent outbreak of the foot-and-mouth disease in the United States and the steps being taken by Canada to prevent its introduction into this country. We had received no information on the subject, and should like, if possible, to be kept up-to-date in such matters.

I may also say, that when we forward to the Publications Branch, applications from farmers to be put on the mailing list, we never know whether they are put on the list or not. In fact, men frequently advise us later on that they have received none of our publications, so that, if they are put on the list, nothing is sent them.

Mr. GRISDALE: As to the mailing list, we are sending names from here almost daily and do not know whether they are placed on the list or not. We also frequently hear several months later that publications have not been received. The situtation is getting worse all the time in the matter of distributing our publications, until at present we hardly know where we stand or what to depend on. Some people on the mailing list get two or three copies of our publications, others apparently

get none. In short, the lists are in a chaotic state. I have been trying persistently to have the lists handled in a different way. I found that it was proposed to cut off the list all those who had not replied to cards issued asking them to state what class of publication they were interested in. Now there is no use trying to run a mailing list in this way, by cutting off, say, 30 per cent of the names and at the same time sending duplicate or triplicate copies to 25 per cent. It is the most ridiculous thing I have ever seen.

I reached a decision in my consideration of the matter the other day, and have a plan which will avoid duplication on the one hand and the cutting off of names on the other, unless the latter is requested, or the material mailed comes back unclaimed. I am preparing a long memorandum on the subject, which would have been completed had it not been for these meetings, and I propose to do my utmost to have my suggestions carried out. I would advise, then, with regard to the resolution just read, that the Superintendents wait to see the action taken on my recommendations.

I have always understood that the Superintendents had small mailing lists of their own, made up of people they knew or were specially anxious to keep in touch with. It is quite permissible for our Superintendents to send these people bulletins, and it is not desired that these lists be sent to Ottawa unless the Superintendent so desires.

Mr. McKILLICAN: Our object in asking that the mailing lists be sent us is that we may be able to make additions there to intelligently.

Mr. GRISDALE. I am afraid it would be a difficult matter to arrange. As I understand it, our lists are on metal stencils, and it would be necessary to have printed lists specially made from these.

Mr. HUTTON: Our resolution refers to the mailing lists from our own provinces only. As it is now, our publications are sent to many people living in towns who have no interest in them. We could make up lists by corresponding with the various agricultural societies, and so would be able to return to Ottawa an intelligent mailing list.

Mr. GRISDALE: That method should furnish, as you say, an intelligent list. It would be a good way to increase our mailing list.

Mr. FAIRFIELD: These names could also be put on the general list, to receive all departmental publications.

Mr. GRISDALE: That is where the duplication comes in under the present arrangement. Has any one anything else to say? We have so far only stated what all of us are familiar with.

Dr. MALTE: I receive duplicates regularly, one addressed to me at the Seed Branch, although I have not been connected therewith for over two years.

Mr. FAIRFIELD: I also get duplicates, one addressed to me care of Fairfield Bros., although it is over ten years since I have been in that firm.

Mr. GRISDALE: I believe cards were sent to every one on the mailing list, asking whether they wished to have our publications continued to their address. Why did you not return the one addressed to you at Fairfield Bros.? You could have had that copy discontinued.

Mr. FAIRFIELD: I presume I overlooked it.

Mr. GRISDALE: I am sure that at least 75 per cent of those receiving these cards did not return them for the same reason.

Mr. HUTTON: With a reasonable amount of clerical work on the branch Farms, we should be able to submit lists of those who would benefit from our publications, and could strike out the names of those who have moved away or died.

Dr. SHUTT: Do you think you could do this; that is, compile a complete provincial list?

Mr. HUTTON: I did not say that it would be complete; but we could get a large number of good names by addressing letters to the various agricultural societies, saying that we are enclosing a copy of the mailing list of their district and asking them to add thereto, and strike out those who are not interested in our lines of work.

Dr. SHUTT: We had the mailing list in our own hands until two or three years ago, when the Publications Branch was formed. Since then, the distribution of our bulletins and reports has given more trouble, has been less satisfactory, and more costly. But the Publications Branch has an official existence; it has, I believe, a large personnel, and we can hardly commence now to make requests leading to the suppression of that branch or the removal of some of the work assigned it. I doubt if that branch could undertake to reply to a Superintendent every

time a name is received from him for the mailing list, so that we have no idea of the action they take. It would not be safe to promise success from any attempt we may make to better this state of affairs. The sending to the Superintendents of provincial lists would necessitate printing the names from the stencils and would involve printing supplementary lists every few days.

Mr. GRISDALE: Mr. Watson has two or three schemes for enlarging the mailing list and making it a live one; one of these plans is that of corresponding with the secretaries of agricultural societies. He has also a plan for avoiding the duplication already referred to. I hope to bring our mailing list up to the half-million mark, even if we have to do the whole work ourselves. I shall, I hope, say more of this on Monday, when I shall have Mr. Watson here. If possible, I shall get you to compile lists for each province. Mr. Spencer will also be here on Monday, and he will be able to give you some detailed information.

As to the second part of the resolution, dealing with the receipt of all circulars, regulations, etc., issued by the different branches of the Department, I think that it could be easily arranged. I will see that your names are placed on all lists to receive such material. I could not say as to your receipt of such circulars as were issued *re* the foot and mouth disease.

Mr. ARCHIBALD: I have tried repeatedly to get the Publications Branch to put me on the Veterinary list and the Live Stock list, but I have invariably to write the originating branch for anything they bring out. I have been wondering whether the Superintendents are in the same box?

Several SUPERINTENDENTS: Just the same.

Mr. ARCHIBALD: I received a copy of the foot and mouth disease circular, by mistake. It was sent me by the firm printing them. They were sold in the regular way at 25 cents per copy. I sent the firm a list of our live-stock Superintendents.

Mr. HUTTON: Our next resolution deals with the compilation of the summary reports:—

> In order to present promptly to the farmers in the districts in which the Farm is situated the results of the work accomplished, in as interesting and concise a form as possible, we would suggest a complete summary of the more important details of the several divisions under

our direction to November 30 of each year. That is, to have the present summaries assembled and to them add the work of the remaining Divisions and to extend or elaborate when necessary along such lines as would best meet local needs, and thus have a publication for local distribution, the need of which we all keenly feel.

That is, something like a reversion to the former "author's edition" of the annual report, only it would be published in the fall with the summaries, and would reach the farmer, with them, before he began his next season's work. We feel that the summaries as now issued are not as complete as they might be, and that live-stock work should be included. The latter is published now a year after the work itself is completed.

Dr. SHUTT: What is the significance of the word "divisions" in the resolution? Does it mean divisions of work, or geographical divisions?

Mr. HUTTON: Divisions of the work. We mean that, if the present summaries are continued, the material be reassembled under the head of each Farm, the other lines of work added and the whole distributed to the farmers of our respective districts.

Dr. SHUTT: What other lines of work would you include with the four now reported on?

Mr. HUTTON: Poultry, live stock, and apiculture.

Mr. GRISDALE: We now report on horticulture, cereals, forage plants, and field husbandry.

Mr. BLAIR: We Superintendents feel that we would like to have a publication showing what has been done on the Farm under our charge. If we had such to hand a man or send to a list, it would do both us and him more good than if we sent a greater amount of other matter. I do not think it unreasonable for us to ask for an author's edition, although I realize the difficulty of getting it up. By making the summaries more complete, say half as long again or twice as long, we could give much more detailed information, the material could be reassembled into the author's edition, which would include animal husbandry, or that part of it which was ready for report at the time.

Dr. SHUTT: Is this author's edition to be sent out by the Publications Branch? (Laughter.)

Mr. GRISDALE: Then in addition to the lines now dealt with, it is proposed to report on bees, live stock, and poultry?

Dr. MALTE: What about botany?

Mr. GUSSOW: The work in botany is not connected with any special Farm or Farms.

Mr. GRISDALE: The work with bees for the season could, I suppose, be reported on at that time, and the live-stock work for the previous year.

Mr. MCKILLICAN: That would be better than postponing the reporting of that work until March of the next year.

Mr. HUTTON: The summaries would also contain the results of such experiments as we considered finished.

Mr. GRISDALE: How would you distribute these local summaries? You have no mailing lists except very small private ones.

Mr. MCKILLICAN: Like other publications of a local character are distributed.

Mr. GRISDALE: There would be difficulty in dividing the list into geographical areas.

Mr. HUTTON: It might be done, I think, in the same way that Mr. McKillican's bulletin on Corn Growing in Manitoba was distributed. I do not suppose that was sent out to all Canada. There must be provincial lists.

Mr. GRISDALE: I do not know how the lists are divided.

Dr. SHUTT: Bulletins sent out from the branch Farms require postage, and could not be issued to a very large list for that reason.

Mr. GRISDALE: The regulations forbid the issuing from the branch Farms of publications to our regular mailing lists.

Mr. CLARK: They could be distributed at farmers' picnics and agricultural meetings. I find great interest in our publications shown at such gatherings.

Mr. GRISDALE: Our summaries are intended to give quick information. The facts brought out in our annual report, although coming out later, are just as good as when first obtained, but they are apt not to have the same effect as when given out "fresh from the sod." That was the idea in bringing out the summaries. It is a question whether, if we enlarged these summaries, they would not be considered as reports and hence require to be submitted to the House before being distributed.

Mr. MOORE: That point occurred to us and was one we required information on.

Mr. GRISDALE: There is no objection to the issuing of summaries, but they cannot be termed reports. They are simply abbreviated accounts of the work we have done along certain lines, giving information which will be of value to our farmers the next season. If the publication had first to be submitted to the House, it would be two seasons before it was in the farmers' hands. We might be able to make out a fairly strong case for distributing the summaries without this delay.

In former years, under the late Director, we issued a publication of a quite similar character, though it was confined to the tests of varieties of cereals. After being discontinued one year, it was recommenced in an extended form, including not only the variety tests of cereals, but also work in horticulture, forage crops, and rotations. If this were amplified much more, we should practically be issuing two reports.

*Dr. SHUTT: I mention, so that our Superintendents will understand, that our annual report must be tabled in the House. If the House does not meet until February, the report cannot be issued until presented in the House. So that these summaries could not be brought out in the form of a report and distributed without being first tabled.

(*NOTE.—It has been learned since the Superintendents' conference took place, that an Order of the House exists changing this procedure. A report may now be issued to the public upon authorization of the Deputy Minister of the Department before tabling in the House.)

Mr. HUTTON: I suggest the term "summary" for this reason.

Mr. GRISDALE: We might call them summaries or bulletins and so dodge the issue, but the Minister might not be willing to expose himself to possible questioning in the House.

Dr. SHUTT: It would be practically setting up the material twice.

Dr. MALTE: I understand that the publications under discussion are to be the results obtained at the Experimental Farms and Stations. These, it appears to me, could be published from time to time as bulletins, as the data on a line of work are completed.

Mr. GRISDALE: The summaries give the results of the work annually, even if the experiment is not completed.

Dr. MALTE: The bulletins I refer to would not be published until after final results were obtained. They would not come out yearly.

Mr. GRISDALE: I have been considering the question for some time. The question of the best way of bringing out the results of our work is a difficult one. It is debatable whether our annual reports are not being made too large and detailed.

Mr. MOORE: Is an annual report called for in the Act establishing the Experimental Farms?

Dr. SAUNDERS: The Act, I believe, calls for a full and detailed report of the work each year.

Mr. GRISDALE: I believe so. I will read to you a letter which I have sent the Deputy Minister with reference to these author's editions. Last year, in visiting the Farms, I asked each Superintendent how he liked the new way of bringing out the annual report and discussed the reasons for the changes made, the improvements and disadvantages resulting therefrom. Before writing the letter I am going to read, I got from the Printing Bureau estimates of the cost of bringing out a small author's edition for each Farm, where all lines of work at that Farm would appear in the same publication. I read the letter to the Deputy Minister:—

> In connection with the issuing of our Annual Report, some of our Superintendents have remarked that they occasionally have a visitor who asks for a report of the work at their Farm or Station. As our report is now arranged, the work at each Farm appears under different headings in different parts of the report, and to respond to a request such as the above, it would be necessary to give the inquirer a copy of our whole report, from which he would be obliged to cull here and there the information he required as to the work along different lines at any one Farm. It occurred to me that perhaps without too much expense, we could bring out a very small edition of the report of the work at each Farm simply by gathering together the reports of their work along the different lines as set upin type for our complete annual report. I inquired from the Superintendent of Printing as to the probable cost

of this, and he gives it as about $31 for an edition of 250 copies of the report of each Farm which, for the fifteen branch Farms for which such report would be required, would make a total of $465, or, at the outside, say $500.

In my opinion, this expenditure would be warranted for this purpose. In addition to furnishing in a compact form the information required by a visitor, it will be quite naturally a source of gratification to our Superintendents as representing to such a visitor the work of the Farm in its entirety. I should be obliged, therefore, if you would have a requisition issued for the bringing out of the following numbers of these separate reports:—

Charlottetown, Fredericton, Nappan, Kentville, Brandon, Indian Head, Rosthern, Scott, Lethbridge, Lacombe, Agassiz, Invermere, and Sidney, 250 English each.

Ste. Anne de la Pocatière, 50 English, 200 French. Cap Rouge, 100 English, 150 French.

The work cannot, of course, be undertaken until the Printing Bureau is through with the type as it now stands for the entire Experimental Farms report.

This will provide for an author's edition, as in the past. It will not be sent to any mailing list. I am afraid that the bringing out of the summary of the work at each Farm as you have suggested would be impossible to get through, unless you would suggest that the summaries as now arranged be done away with.

Several Superintendents: No, we would not suggest that. We only suggested a re-assembling of the material as now issued.

Mr. Clark: The *Agricultural Gazette* does not reach the farmer?

Mr. Grisdale: No.

Mr. Moore: Referring to the letter just read, I would say that if we had known of it at our meeting the other night, it would have saved some two hours of discussion. For one, I am in favour of Mr. Grisdale's plan for these author's editions. They will not be issued quite as soon as they would be by the other method, but they will serve to hand a visitor and will satisfy the Superintendent's natural pride in the work of his

own Farm. Lots of farmers in our districts, while they like the large report and will discuss the work reported in it, want something from their own Experimental Farm. I got an author's edition the first year I was Superintendent, and while there was not much information in it, it pleased the people. I think Mr. Grisdale's plan meets the situation.

Mr. BLAIR: It is not intended to distribute these at exhibitions?

Mr. GRISDALE: No. Our bulletins and exhibition circulars are for that purpose.

Mr. BLAIR: The latter do not draw attention to our Farms. I could distribute 500 author's editions at fruit grower's meetings.

Mr. GRISDALE: Do these fruit growers not receive our publications?

Mr. BLAIR: I cannot find out.

Mr. GRISDALE: How many would you suggest be issued of these author's editions.

Mr. BLAIR: One or two thousand.

Mr. MOORE: The numbers vary for the different Farms.

Mr. BLAIR: I distributed 1000 reprints to the meetings of the Fruit Growers' Association alone.

Mr. GÜSSOW: In connection with publishing the results of the work of the branch and Central Farms, the practice which I have followed for some years in my own Division is to report at the end of each year the progress made in each line of experiment carried on. As soon as we finish our investigation in any one line, we collect the data obtained into a bulletin which we publish at any time, quite apart from anything we may have issued in a report. I quite realize the importance of bringing the results of the work without delay before the public. The report of progress appears, however, in the annual report as at present brought out and should the work come to a conclusion at any time during the year, a circular or bulletin may be issued immediately. The Division of Botany has brought out two or three circulars during the year quite independent of any summary.

Mr. GRISDALE: The bringing out of bulletins in this way has been a general practice in my own case as well as in others. But the great object of the "summary bringing out of the summaries" is that it gives the farmer facts "fresh from the

sod'' year by year. If this way of reporting could be allowed it would make a great difference, although I am not sure that any advantage would be gained by including bees, live stock, and poultry.

I do not object to any brief summary of an interesting experiment being published in our agricultural press, although I do not altogether like to see our powder burned in this way. When our report comes out later, the farmer is apt to say: "Oh, I saw that in the *Advocate* a year ago." I have made no objection to these articles, however, as our regular reports are delayed, and we should experience difficulties if we were to try to get out summary reports. I would suggest that we be satisfied with the progress made both in the matter of "separates" and summaries this year. It is too late to go further this year, and I do not consider it possible or advisable to issue summaries and arrange the matter again into separates for each Farm. The material placed in the farmer's hands should not be duplicated.

Mr. FAIRFIELD: You would not think it wise to make separate summaries?

Mr. GRISDALE: You mean to put only the summaries of results from the one Farm into the one volume?

Mr. FAIRFIELD: You will understand that it is not for the personal glorification of the Superintendent that this change is suggested. Such an arrangement would give the seasonal conditions in a way which would be most useful to the farmers in the district of each branch Farm. Cultural methods for each district would be emphasized, and the best methods to follow in, say, the Lethbridge district, would not be confused with those best for Prince Edward Island, which now appear in the same volume.

Mr. GRISDALE: The farmer would know when he was reading the Lethbridge report would he not? It is quite distinct from the Prince Edward Island report.

Mr. FAIRFIELD: I think they would do more good in our own districts if brought out in the way I have mentioned.

Mr. GRISDALE: How would you distribute them?

Mr. CLARK: I would incline to the first idea of assembling the synopses as we now have them into summaries from each Farm. They could be distributed at farmers' meetings.

Mr. GRISDALE: We could distribute a few thousand of each from the mailing list. We might, instead of printing the summaries as they now are, put all the material from the one Farm in the one volume.

Mr. MUNRO: That would give us what we want.

Mr. GRISDALE: I do not want to do the work twice, that is, bring the summaries out in both ways.

Mr. MCKILLICAN: We would not like to ask the elimination of what is now being done.

Mr. GRISDALE: The present form of the summaries is not at all fixed. There is no objection to a change of form if it is considered an improvement.

Dr. SAUNDERS: It would be an advantage in that it would avoid any appearance of repetition between the autumn bulletin and the report.

Mr. GRISDALE: I like the idea.

Mr. BLAIR: It is what we want.

Mr. GRISDALE: Why have you not asked for it, then, before this?

Mr. ARCHIBALD: The introduction of live-stock work into the subjects dealt with in these summaries of results would be of no material assistance. Take, for instance, Mr. Clark's live-stock work at Charlottetown. It is always finished by Easter. We get his report by the last of May. The whole work he has carried on gets into the farmers' hands in the annual report as soon as it would in any other way. It would appear, half in the summary of one year, and the rest in the summary of the next year. The result would be confusing.

Mr. GRISDALE: I quite agree with you. We might get out a live-stock summary later on each year, containing all of the year's results.

Mr. MUNRO: I thing that in arranging for separates of the annual report, the Director has already given us what we desire.

Mr. CLARK: More.

Mr. GRISDALE: I think that this is an opportune time for me to state that I am not satisfied with the way in which a number of you prepare your reports. They are got ready in a very slipshod manner, and I regret to see them reach here in such shape. It causes much work here and is certainly no credit to the author. I hope that you will make a special

effort to get out your reports in better shape and take more pride in reporting on your work. The English is bad, the calculating is bad, and there are errors *ad lib*. The expressions are often so bad that it is impossible to understand the meaning intended. I may possibly exaggerate in some cases, but I wish to impress upon you the importance of getting your report material into better form. There is no excuse for most of the faults committed therein. I do not see your reports until the officers here have gone over them, have made innumerable corrections, after which they are still lacking in sense in places, are full of stilted English, and are a hodge-podge at best. I hope you will take these words to heart and do better. I am willing to concede everything possible in the way of a prompt reporting of your work and bringing the results out in a way satisfactory to you. I think on your part you should prepare the material as well as you possibly can.

I have put into written form a few of the criticisms and recommendations which I desire to make, with a view to the establishment of a higher standard in our material for the press. The remarks made therein are addressed to our officers here quite as much as to the Superintendents of the branches. I have entitled this article "Our Publications" (see Part III).

Mr. Hutton: We will now take up the third resolution on our list:—

> It is the feeling of this meeting that to secure best results in the work of the branch Farms and Stations, the maximum salary for foremen should not be fixed at less than $100 per month.

I would say in explanation that under the present limit of $80, I feel that the Department is losing good men (I know of one case, and there are possibly others) to the Provincial Departments in the west, which pay more. Foremen who have been with the Experimental Farms system for some years are more valuable at $100 per month than they were in the beginning at $60 or $70, owing to their years of experience. The raise in maximum suggested does not mean an annual increase to that limit. Merit would determine whether the increase was granted. It would depend upon the recommendation of the Superintendent and the Director.

Mr. GRISDALE: The matter of salaries is one which the Director has not power to decide. He can recommend only. The point raised by Mr. Hutton is one of the difficulties our Superintendents have to encounter. It seems to be always regarded as necessary that the increase be $5 per month. In the Inside Service the increase is only about $4 per month, even in the case of men who are getting considerably larger salaries than are the foremen of the branch Farms. To increase the latter by $5 per month is out of the way. It takes them only four or five years to reach the limit. It is hard to say by how much their salary should be increased each year. Twenty-five dollars is not enough. If we said $50 per year, it would be awkward in making out the monthly pay-sheet.

As to the maximum, I think $100 per month for a foreman is a pretty high figure, too high for most foremen. They get a free house, which is a considerable item anywhere. It is worth $10 per month at least, generally more. Add this to their salary and they would be very highly paid indeed.

Unfortunately, our foremen have no particular qualifications, merely general ones. They are merely put on because they are good working men, or for other reasons. They are simply superior labourers. To pay such men $110 to $115 per month is pretty steep. If we could get really first-class foremen, men with two or three years' training at an agricultural college, I might be willing to recommend the maximum asked. But under present conditions, I find it difficult to enter into the spirit of the resolution. I am quite willing to hear any arguments in its favour, however. I know what the argument of some of the Superintendents will be, that they have lost men of the kind I have described, and they would like to offer the inducement to their foremen in future that they would be raised to $100 by gradual steps. I am sorry to say that for one foreman of that kind, there are fourteen who are not worth that maximum. I cannot see my way clear to concur in the resolution.

Mr. MUNRO: I have no immediate interest in the matter. I have always got a raise for my foreman when I asked for it. I have always told my foreman that if he saw a chance for something better, I would not stand in his way. He was offered a position as foreman on a penitentiary farm at $1100

and a free house. He remained with me at $75. I think that when we have a man of that kind, his salary ought to go higher than $80 per month.

Mr. HUTTON: The resolution does not contemplate a fixed raise. In many cases the foreman would not get beyond the present limit. It is not the idea that, if the maximum is raised, everyone will get it. If that were the case, I should prefer to have matters rest as they are now.

Mr. GRISDALE: You know what the Civil Service is. Any raise given must be uniform. If I give a $5 raise to the foreman on Vancouver island, the foremen on all the other Farms would know.

Mr. HUBBARD: We vary the scale of wages on the different Farms.

Mr. GRISDALE: We can handle the matter of wages. Foremen, however, are appointed by the Minister, and hence consider themselves superior to the ordinary workmen, and cause trouble.

Mr. BLAIR: Are we to understand that the present limit for foremen is $80 per month?

Mr. GRISDALE: Those are the Minister's instructions.

Mr. HUBBARD: I will read the minutes of the meeting Saturday:—

> Moved by Mr. Blair, seconded by Mr. Fairfield: In view of the fact that we are instructed to collect and preserve material for exhibition purposes, and a suitable place is desirable for its preservation and display as well as for placing collections of samples, weeds, insects, etc., therefore, it is resolved that we request the Director to authorize the provision of a suitable room for such a purpose on each Farm.

Mr. GRISDALE: I am in full sympathy with this suggestion, and will have provision made to meet it as quickly as it can be done. But I cannot say when it will be done. Construction work has been completely stopped for the present, and I do not know what will be done in that direction in the future. Our Public Works vote has been cut in half, and I do not know whether we shall be permitted to use the money which will be voted us. This year we have not been able to use any of our Public Works vote except on such small jobs as we have been

able to do ourselves by day labour. I do not know how long this state of affairs will continue. In any building operations requiring contracts there has been nothing done. It has apparently been impossible for the Public Works Department to get tenders at a reasonable figure for any building we wished erected, but could not put up by day labour. We have had plans of buildings in that Department for two years, and nothing has been done in the matter yet in the way of letting a contract. You know what has been done on your Farms by day labour. That is all that has been done, and next year we may not be able to do that much.

Mr. HUBBARD:

> The need has been felt by many of the Superintendents for a collection of the economic insects of the different districts with life histories and methods of combatting the same. We would suggest that such collections be furnished to each Farm or Station if possible.—(Moved by Mr. Clark, seconded by Mr. Hubbard.)

Mr. GRISDALE: I would suggest that this matter be brought up on Monday, when Dr. Hewitt is at the Farm. Let some one of you take the question up with him, if an opportunity occurs.

Mr. HUBBARD: Our next resolution is as follows:—

> Feeling that the Superintendents should have the benefit of a library comprised of the latest books on agriculture in its various phases, it is our opinion that the Superintendents would be greatly aided if the officers of the various Divisions would kindly advise all the Superintendents from time to time of any new books or publications along their special lines that they advise the Superintendents to get, giving necessary particulars for ordering.

Mr. GRISDALE: I do not know how many books a year you are getting at the branch Farms. I remember that we are sending you Bailey's Encyclopedia of Horticulture at present, as fast as the volumes are issued. Now and then I have some book ordered and sent you. I do not think it well to have too large libraries at the branch Farms, for the reason that the Superintendents have not the time to read a large number of

books. It is better to get a smaller number and read them carefully. If any officer sees a notice of a book which he thinks would be useful, he is at liberty to ask that it be ordered for him. If he is specially interested in a certain line of work, I have no objection to getting him special books on that subject. I do not wish to be strict in this matter, and the Superintendents will find no difficulty in their getting any really useful book they ask for.

Mr. FAIRFIELD: It was thought that the chief officers at the Central Farm would be more apt to be familiar with the latest and best books along their lines of work, and they could advise us.

Dr. MALTE: The idea is that I notify the Superintendents *re*, say, a certain book on alfalfa, and the latter would then ask the Director for authorization to get it?

Mr. GRISDALE: If Dr. Malte saw a good book on alfalfa, why should he not ask me that copies be ordered for the branches?

Mr. FAIRFIELD: The only objection would be the danger of duplication, in case some Superintendent already had the book.

Mr. BLAIR: From my viewpoint, a library should be established at each branch Farm, containing works of reference, etc., so that the Superintendent would have the best works on all lines of his work. The heads of Divisions should best be able to decide what these best works are. A list of books on hand might be sent from each branch Farm.

Mr. GRISDALE: I think that the plan of writing the Superintendents *re* books recommended would be safer.

Mr. MACOUN: It would make a large amount of clerical work here. If we noticed a book we wished to bring to the attention of our Superintendents, it would mean writing 17 letters.

Mr. MOORE: I think that on those Farms where live-stock work with certain breeds is being carried on, something in the way of Herd Books should be provided. I often have inquiries *re* pedigrees. Would it be possible to have the branch Farms put on the list to receive these herd books?

Mr. GRISDALE: No. All our registered stock is in the name of the Director of Experimental Farms, consequently that officer is the only one receiving herd books free; but if you will write me asking that certain herd books be secured for you, I will

look into the matter with a view to securing them for you if possible.

Mr. HUTTON: These are all the matters which we had noted at our meeting for discussion with you.

Mr. BLAIR: There is is another point I should like to take up, in which the Maritime Provinces are particularly interested. We feel that we are not receiving sufficient assistance as far as entomological work is concerned.

Mr. GRISDALE: There are only about twenty entomologists down there from the Department at Ottawa.

Mr. BLAIR: There are none at the Experimental Farms or particularly interested in entomological work as it affects the farmer. There should be some one going round from one Farm to another, keeping us in line with the latest phases of entomological work. The same applies to plant pathology, apiculture, and poultry work. My idea is that if there were one good man in each line visiting the Farms in rotation, we should be able to get very much more work done in these lines. It is now almost impossible to do much. It would make the Farms centres for direct information if we could have these men connected directly with them.

Mr. GÜSSOW: I do not quite understand the last remark. Are these men to do the work the Superintendent wants them to do?

Mr. BLAIR: Their work would be part of the work of the Stations to which they were attached.

Mr. GÜSSOW: I realized three years ago in my own work that the investigation of many problems could not be limited to the districts where there was an Experimental Farm located. Diseases of peach trees in the Niagara could not be investigated at Ottawa; so we had an officer appointed to carry on investigational work in the Niagara district itself. He has been of considerable assistance to the fruit growers there, and the results obtained warrant the continuance of the work in that locality.

In connection with our investigation into potato diseases I had intended to place a man in Prince Edward Island two years ago. Such a man might have his mail directed to him at the Experimental Farm, as it would give him a standing to have a good address, but his work could only be carried

on to a limited extent within the Farm boundaries. He would be obliged to carry it on in all parts of the district served by the Experimental Farm. In Prince Edward Island, it was planned to have experimental fields in Kings county and Montague county for the study of problems in potato diseases. The plan has worked well in the Niagara district and I had intended to follow the same method in the east. The difficulty was in securing men. Among the agricultural students graduating there was only one who had specialized in biology and plant pathology. I preferred not to place inexperienced men in the field, and thought it better to give them one or two years' training here and then send them out. I have been notified that the Minister has authorized the appointment of a man for Prince Edward Island and New Brunswick and also one for Nova Scotia, where Club Root is very bad and requires study. This work would not engage the whole time of these men and they would be available to assist the Superintendents in their problems, as their time and the importance of the problems presented by the Superintendents would warrant. The work of investigating "bitter pit" of apples is also important. It must soon be taken up, and there are also the diseases of the cereals which are appearing in the west. Researches could be carried on as to the nature and cause of these diseases and, as at St. Catharines, ten or fifteen different investigations could be carried on at the one time. If such men are appointed, naturally any request for assistance from the Superintendent of a branch Farm would receive immediate consideration, and I should be glad to have these men give all possible help.

Mr. HUBBARD: I understand Mr. Güssow to say that these men would be available to us?

Mr. GÜSSOW: Yes. Suppose a man were studying Powdery Scab of potatoes. After the field inspection work was over, his whole time would not be occupied during the rest of the summer, and if the Superintendents had other problems of economic importance, their requests for his assistance would receive every consideration.

Mr. BLAIR: Then we may say that these men are assured us another year?

Mr. GRISDALE: No. I should like to give them to you, but to get them is another matter. I will say this, that as

far as the influence of the staff here goes, you may expect to get the help of a man in plant pathology and possibly poultry. I will not promise anything about the other two men, in entomology and in apiculture. We are not dealing with entomological problems now.

Mr. BLAIR: You see the importance of having such a man in entomology, however?

Mr. GRISDALE: I cannot say that I do.

Mr. BLAIR: If it is desired that the Superintendents furnish information directly on entomological matters, it would help materially.

Mr. GRISDALE: Expert knowledge of insects is not demanded from our Superintendents. It would not be practicable to have an entomologist circulating among the Farms offering suggestions and solving problems of the identification of insects. All work of this kind can be done by the Entomological Branch at Ottawa. One reason I agreed to the severance of that Branch from the Farms was that I did not consider their work part of that of the Experimental Farms, and when the question of separation came up, I not only raised no objection, but rather facilitated the matter, on account of the trouble of authorizing all matters connected with administration of the Destructive Insect and Pest Act. In case any of our Superintendents have any entomological problems in which they require assistance, I am sure Dr. Hewitt will be only too glad to hear from you. Write to him directly and he will give you all the information he can. His inspectors will be glad to visit you and help you. I do not see the advantage to be gained from having an entomologist travelling round the Farms, however, planning research work or identifying specimens. If insects are sent you for identification, forward them to the Entomological Branch at Ottawa. I cannot agree to the expansion of our work in this line.

As to having a plant pathologist, I quite agree with you. As to a poultryman, if I heard of a very good man, who I thought would be capable of handling the work, I might approve until you got your feet under you with the poultry work in the Maritime Provinces. In bee work, such a man is hardly necessary. The season with bees is short in so far as special attention is demanded, and to engage a man to visit the Farms and offer

advice and help would not prove a good investment. He would have to stay a week at the least at a Farm to be of use and by the time he had got to the fourth Farm the season would be over. The Superintendents must depend on self-training in this, and Mr. Sladen's help.

Mr. SLADEN: We need a good man on one Farm.

Mr. GRISDALE: We have one good man here.

Mr. SLADEN: We need a good man at Nappan.

Mr. GRISDALE: Train the man you now have at Nappan. If you can induce one of the men to make a special study of bees and become proficient in their care, I would be willing to make it worth his while. But I intend to adhere to the policy I laid down in the first place, that bees and poultry must be looked after by the one man, or at least take up only one man's time, if looked after part time by two men. I should prefer that the one man looked after both.

Mr. ELFORD: I hope to be able to take up this with the Superintendents on Monday.

Mr. GRISDALE: I wish to be present when that point comes up for discussion.

Dr. SHUTT: I should like to say a few words on agricultural meteorology. It is quite unnecessary to emphasize the influence of "season" on our crops; we all realize that "weather" is a factor of prime importance in affecting yields; indeed, it may frequently be the direct cause of success or failure. After a thorough preparation of the soil, after all pains to ensure an ample supply of available plant food, after all care in putting in the crop and keeping it free from weeds and disease, our work may be brought to naught by unfavourable weather conditions—a season of drought, a week or two of rain at the wrong time, a hot wind, an early frost—these are the factors that often upset our calculations. On the other hand, our bumper crops are undoubtedly the result of favourable weather conditions, the timely rain, the sunshine, the genial temperature. While we know all this, as it were, in outline, we know very little of the details, as, for instance, the particular weather conditions for any specific crop at the various stages of its growth which result in a fair crop,a good crop, a bad crop. It is desirable that we should know this; the knowledge may be of help to us in many ways—ways as yet unthought of.

You are aware that this subject has interested me for many years. With your assistance I have been studying one phase of it since 1905. I refer to the influence of climatic or weather conditions on the composition of wheat. That investigation has yielded results of great importance, showing, among other things, how the summer conditions of our Northwest, Manitoba and Saskatchewan more particularly, are as a rule extremely favourable to the production of high-quality wheat. I need not refer to this work in detail here, as it has been constantly written up in the Annual Report of the Division of Chemistry. It is familiar to you all. We hope to continue this investigation, extending our observations, thus making it still more valuable.

Early in the present year this subject of Agricultural Meteorology was brought very prominently to our notice by Mr. R. F. Stupart, the Director of the Meteorological Service of Canada. He thought we might co-operate and, by joining forces, bring some sort of order out of what is, at present, almost chaos—at all events, a number of disconnected facts. He thought it might be possible to correlate the weather conditions with the crop growth and crop yields, and I think this, in a large measure, may be possible. Other countries, and notably Russia, have done a considerable amount of work in this direction, and there appeared to be an opportunity for Canada to join what promised to be an international investigation. Owing to the European war, our immediate prospects for international co-operation in the solution of this problem have disappeared, and we must, for the present, do what may be possible without the assistance of other countries. But with your help, gentlemen, we can make a beginning, and I believe it can be done without asking of you much additional labour. We can amplify or increase the observations we have been in the habit of making for "influence of environment" work, and Mr. Stupart will undertake the correlation of these observations and data. To this end he has appointed an assistant, Mr. R. W. Mills, B.Agr., to take the work in hand and to make a study of what has been done in other countries, to send out the form containing the questions to be answered throughout the season, and, finally, to take these forms and from them make deductions as to the influence of the weather conditions on the growth of the crop under observation. I ask for your enthusiastic co-operation in

this matter. Mr. Mills is at present preparing the forms to be sent you, and also an outline of the movement, which will appear in these proceedings. The whole question is one of great interest and one which will, I am sure, be to the advantage of Canadian agriculture, though at the moment it may be difficult to say in what way or from what direction the specific benefit will come.

(See Part III for article by Mr. Mills on this work, entitled "Crops in Relation to Weather.")

Monday, January 18.—Session 9.00 to 12.00.

POULTRY.—MR. ELFORD.

Mr. F. C. Elford: We have at present just eleven Farms where poultry is being kept. There is no poultry at Ste. Anne de la Pocatière, Rosthern, Scott, Summerland, or Sidney yet. The Director was very wise, I think, when he said at the start to go easy. The aim is to have no more poultry than one man can look after, about two to five hundred hens on each Farm. I don't know just how many we should have, but it is better to have fewer than one man can look after, as it is better not to overload him. It is not a question of quantity, but quality and neatness, and it is a question of doing what we have to do well. Mr. Moore has 500 hens, and his man is looking after those, is keeping his plant in ideal condition, and, by the way, is doing some other good work as well. It is not our intention to multiply the varieties or the breeds. Cap Rouge, for instance, has only one variety, the Barred Plymouth Rock. I don't think we should get too many varieties, two or three are plenty for any Farm, and the kinds will be influenced by the breeds or varieties that are giving the best results in the locality.

In regard to experiments, the first essential is to keep the plant clean. It is better to have fewer hens, but have them in neat surroundings. There should be some experimental work done in the way of housing, and also a little in connection with feeding, although there will not be time for many experiments at the branch Farms, except those of a local nature. Housing is largely a local proposition, and we will pay attention to the

styles of house which are going to give us the best results in each locality. A few experiments as to feeds and feeding will be in place. Locally-grown grain will always have the preference, but, should it be necessary to use other grains, we must be sure that it will pay to buy it before advising farmers to use it. The amount and number of experiments will depend upon the man in charge. Do not multiply experiments and have the man become confused. One experiment well carried on is better than two experiments half-done.

We might have waterfowl and turkeys at some of the Farms. Waterfowl, I think, can be taken up where there is a demand in the neighbourhood. In some instances, waterfowl may give better results than hens, but they should not take the place of hens. The Indian Runner duck is supposed to lay about 300 eggs in a year, and we tried these ducks last year for the production of eggs for table use. The experiment was to find out whether the Indian Runner duck eggs could be used on the table or not. We have a list of customers here, in which is included Government House, and we regularly send out eggs to these customers. We sent out a few duck eggs included in their regular shipment, with a note saying they were Indian Runner duck eggs, and asking them what they thought of them. The replies we have had were favourable, a great many would just as soon have the duck eggs, while some even preferred them. The flavour is much the same as a hen's egg. There are in Canada, possibly, farmers who might breed Indian Runner ducks for egg production. They lay more than other ducks. Just how many we might expect from them, however, we do not know yet.

Mr. CLARK: I am of the opinion that two varieties are quite sufficient. One breed for general purposes and the other of a laying strain.

Mr. MOORE: I have Barred Rocks and Leghorns. The Barred Plymouth Rocks give 50 per cent better results than the other breed, and they take less feed to make the same number of eggs and greater weight of eggs.

Mr. ELFORD: The pullets of both breeds at Agassiz produce eggs about one-third less cost than the hens. One breed might be sufficient for the start, at any rate, and the fewer the varieties the more experimental work can be done.

Mr. W. W. HUBBARD: I have four varieties on the Farm, but I could cut this down to two.

Mr. G. E. PARHAM: I have White Leghorns and Rocks, and I am also trying the Sussex. These are doing better than the other two.

Mr. W. C. MCKILLICAN: I have two breeds, the White Wyandottes and Barred Rocks. I am of the opinion that it would be best for me to keep these two varieties and no more.

Mr. W. H. FAIRFIELD: I have the Barred Rocks and Leghorns, and would like to try these two for a while.

Mr. F. C. ELFORD: We are not here for the benefit of the fancier. It is out of the question to put in every breed that a person wants us to put in, and we should keep the breed that we think best, though possibly we cannot help tramping on breeders' toes.

Mr. W. S. BLAIR: I think that two breeds would be better to carry on experimental work.

Mr. F. C. ELFORD: One breed is really more satisfactory for experimental work; with several breeds the difficulty is that we have not enough of any one variety. This is the case at present here at the Central Farm. We hope, however, to do the most of our work with Barred Rocks.

Mr. W. W. HUBBARD: There would be more interest if four breeds were kept.

Mr. F. C. ELFORD: There seems to be considerable difference of opinion amongst the poultrymen employed on the branch Farms as to the amount of work and number of hens one man should attend to. Mr. Moore's man, at Agassiz, looks after about 500 hens and keeps things tidy and clean, whilst Mr. Clark's man considers he is overworked with 64 hens to look after. Perhaps Mr. Moore will give us some idea of the way his man gets through his work.

Mr. P. H. MOORE: I have 465 hens, and they are in twelve different houses. There are nine laying pens, and three small pens. My man goes through his work absolutely in the same way and at the same time every day, and he has a good system. We hatched out 900 chicks last year. A few hundred of these, however, were very late, and we lost them. A great many were hatched too late, and others were taken away by crows. At the end I had about 600 birds. We had a very large pro-

portion of cockerels. Feed was high and we heard of people in the locality who boiled some of their cockerels and fed them to pullets for meat last fall.

Mr. J. A. Clark: We had an average of 65 hens last year. We were trap-nesting right along, but after a little while my man told me that on account of the immense amount of work he had to do he had stopped trap-nesting, and this without notifying me. He said he must have help throughout the whole season. He got help. We raised 270 chicks, and had fairly good luck with our hatches. The stock was good and matured well.

A comparison was then made of the work done by Mr. Moore's man who has 465 hens and Mr. Clark's man who has but 65. Mr. Moore's plant is not very convenient, and the man in charge has to carry feed on his back about 300 yards.

Mr. F. C. Elford: I would suggest that the Superintendents should find out just how many hens their man can look after.

Mr. Sladen: I have already made the suggestion that every poultryman should spend about two hours a day on the bees. I think that the poultry plant should be not farther than 100 feet from the apiary, in order to avoid much walking. For April and October, about six hours per week are needed, May and September, eight hours a week; July and August, about twelve hours a week, not including watching for swarms. In winter, only four hours per week are required.

Mr. G. E. Parham: I think that less than four hours per week in the winter would be enough, although it depends very much upon the size of the apiary. Two hours per week might be sufficient.

Mr. Sladen: The rule applied to the poultry work should also be applied to the apiary, and that quality and not quantity is what is looked for. What bees are kept should be kept well.

Mr. F. C. Elford: "Marketing."—We shall have to consider the marketing of our produce. I don't think that we should put our produce on the local market, where there is likely to be trouble with local producers, Better for us to cater more to a city trade than it would be to cater to the consumers in our own locality. I am sorry Mr. Langelier is not here, as he has already taken up this phase of the question. We want to put on

the market a good article, and we must be ahead of the ordinary producer. Mr. Blair, for instance, at Kentville, could get some person in Halifax to take up his Experimental Farm produce, labelled, sealed, guaranteed, etc. The eggs could be shipped in boxes containing six dozen cartons. Everything should go to a central grocer, where it should be sold as Experimental Farm produce.

"Catering for a breakfast egg."—It may be well to think this question over. The putting of a breakfast egg on the consumer's table is being done in the United States. They can be put up in three-egg or two-egg boxes, and marked "Laid since your breakfast yesterday morning." Many use two eggs for breakfast. If this was in vogue we could get a better price for our eggs, but, no matter what the egg is called, I think it will be preferable to get a central distributor.

Mr. J. H. GRISDALE: There has been some criticism where two dozens of eggs flooded the market, and it must be remembered that we are not to tramp on anyone's toes.

(Then came the question of the prices of boxes, labels, seals, etc. The one-dozen boxes, it was suggested, could be returned to the branch Farms in bundles.)

Mr. ELFORD: At Saturday night's meeting, Mr. Blair brought up the question of more supervision at the Farms. At Amherst, one the the questions that were discussed by the Maritime Superintendents was the question of having a little more oversight, that is, in the running of the plant. I have already discussed with the Director the taking of a survey. We know actually nothing about the poultry conditions that prevail on farms, and I think it would be of much assistance to our work to have a little knowledge of this. My idea was this: That in the neighbourhood of each branch Farm we should take up a section of ten to twenty-five farms, say an average of twenty farms, and have these visited by an expert who could obtain this information and incidentally assist these farmers in the management of their poultry plant. These farmers could be visited about once a month throughout the whole year, except, possibly, for a few months in the winter. He would have to get his figures by actual count, if necessary, every month. During these visits he could demonstrate seasonable work, such as how to caponize, how to test eggs, how to kill, etc.

A SUPERINTENDENT: Supposing it were possible to start this thing, people might make an objection that some districts were being better treated than others.

Mr. F. C. ELFORD: There would have to be a start, and though it would not be well to lose sight of the first block of farmers, it might be possible to take in new sections in succeeding years.

Mr. W. H. FAIRFIELD: It would be a good thing to advertise the Farms, and I may say that it was striking, at the expositions, to see the special attention that the people paid to the poultry, and I would like very much to see this scheme tried out.

Mr. F. C. ELFORD: The expert in charge will not help the farmers to find a market, but will help them to put their produce in good shape for the market, and could assist the farmers in producing the right kind of article.

If we thought of starting this survey work this year with one man only, would there be a possibility of getting him?

Mr. J. H. GRISDALE: It is a pretty bad year to start, and estimates have gone in and are tight drawn this year. The cost of this would be from $1,800 to $2,000 per year. We may not have the money, but I am willing to make a try.

Mr. F. C. ELFORD: We might begin this work in the Maritime Provinces.

Re "Custom hatching and day old chick business." This is a phase of poultry keeping that is going to be popular in Canada. We want to ship day-old chicks and day-old ducks to a number of Experimental Farms to see how far we can ship, but I think that if the branch Farms could ship day-old chicks themselves it would be advisable to do so. Mr. Hutton already has a list of prices for day-old chicks, and it may be that he will start this work. There are sections in Canada where people are asking for work of this kind, and in Prince Edward Island, for instance, custom hatching will be in vogue very soon.

Mr. J. H. GRISDALE: This is an opportunity for more poultry trouble, and we should try this among ourselves first. Should you hatch eggs for strangers and get bad hatches, there is no doubt that this would cause trouble. And another thing, if you refuse one man and take eggs from another, this first man might cause us more trouble in a day than we could get over

in a month. We should be very careful before going into this on a commercial scale. It is better to try it out among yourselves first. You could exchange hatches. I have no objection whatever that you try this among yourselves.

Tuesday January 19.—Session 9.00 to 10.30 a.m.

THE RELATION OF CULTURAL METHODS TO THE CONSERVATION OF SOIL MOISTURE.—DR. SHUTT.

(PRESENT: Messrs. Fairfield, Hutton, McKillican, Munro, and Tinline.)

Dr. SHUTT: When the experiments in soil culture to be inaugurated on several western Farms and Stations were being planned by the Division of Agriculture or Field Husbandry, it was thought desirable to trace the moisture content of the soil as affected by the several operations and systems of soil management under investigation and to correlate it with the crop yields. In pursuance with this decision we have taken soil samples from a number of the experimental plots to two depths, 0 to 18 inches and 18 inches to 5 feet, periodically throughout the growing season, and determined their moisture content in the Farm laboratories at Ottawa. This work, as you will remember, was commenced in 1911, and, with your help, we have, since the spring of that year, obtained data as to the moisture content of a number of what we might term representative plots in several of the more important series on the Farms and Stations at Brandon, Indian Head, Rosthern, Scott, and Lethbridge. The collection of these samples has entailed a large amount of work which has fallen on the Superintendents and their assistants. This work is still in progress and I have, from time to time, published in the annual report of this Division such conclusions as I thought the data warranted, tracing the effect of the several cultural operations on the moisture content. A summary of the conclusions from the first two years' work will be found in my report for 1913. So far I have not endeavoured to correlate the moisture data with the crop yields. This I am anxious to do as soon as the time can be found for the work.

I am taking the opportunity afforded by this conference of Superintendents to obtain your advice or suggestions for the continuance of this investigation, and I should now be glad if you will tell me quite briefly what you consider your personal observations on the crops of these several plots have made evident.

Mr. FAIRFIELD: In a general way, I think I might say that the differences in yield on the several plots have not been such as the differences in culture might warrant or lead us to expect, though no doubt we have some valuable results.

Among the outstanding results I think we may definitely state that fairly deep ploughing, say 7 or 8 inches is beneficial; it affords a deeper reservoir for the storage of moisture, leading to increased crop growth.

In stubble treatment it would appear that spring ploughing is better than fall ploughing.

In summer-fallowing, early ploughing is certainly to be advised. Its beneficial influence is most marked.

I am under the impression that taking the soil samples monthly, on these small plots—one fortieth of an acre—affects the crops. There is necessarily some trampling and compacting of the soil in collecting the samples, and this in some measure affects the tilth of the soil and the growth of the crops. We do the work as carefully as possible, and I cannot see how we could avoid this error, but an error due to this work assuredly results; the standing crop is to a certain extent injured thereby.

Dr. SHUTT: The only way that occurs to me whereby this could be overcome would be to have duplicate plots under the same cultural treatment, reserving one for the collection of soil samples. I will bear this matter in mind in planning future work of this character.

Mr. MCKILLICAN: Nothing very definite has been observed from various depths of ploughing, though possibly the deeper ploughing is better. We have more rain than they have at Lethbridge, and our results would not be so marked as theirs.

We think there is a disadvantage in subsoiling, at all events at the outset, and this is not due to bringing up the subsoil.

In stubble treatment nothing very decisive has been observed, but the balance of the evidence appears to be in favour of fall ploughing.

In summer-fallowing, early ploughing has generally given the best results. The results are not decisive, and much depends on the time of the rains.

In applying manure I believe it is better to put it on the fallow in September; good results from this have been apparent for the two succeeding seasons.

Dr. SHUTT: I am sorry that we have no representative present from Indian Head where much of this work has been carried on. The results obtained there should be of considerable importance.

When I began this work I thought we should continue it over two rotations. Last year we entered on the second rotation, and I think we should continue to its close before abandoning the work. Extra labour has been entailed by the new postal regulations; we must now box the samples and ship by freight. However, with your co-operation we will continue the investigation. I thank you for your assistance in the past and I sincerely hope, indeed I expect, our labours will furnish useful information on soil management for the farmers of the Prairie Provinces.

ROTATIONS.—J. H. GRISDALE.

(Present: Messrs. Clark, Blair, Baird, Hubbard, McClary, Begin, Moore, Helmer, and Parham.)

J. H. GRISDALE: The object of this meeting is to consider the question of rotations as worked out in British Columbia and the Eastern Stations, and to offer criticisms and suggestions.

It is important that we use the best rotations on each Farm. Sixteen years ago we started using them on this Farm, and have found a wonderful effect upon the productive powers of the land; also a saving of labour, etc. No one can say what is the best rotation without trying it out, and after five years, we made a change and started rotations at the Farms where land was available.

Mr. Hubbard and Mr. Clark have proven that in regard to application of manure putting it on new seed clover where potatoes were to be grown brought great results in "Three-year rotation."

Three-year Rotation has never proved a failure here and is the main rotation on this Farm, on account of the number of live stock kept.

"Four-year Rotation." It pays better to have hay, pasture, but it would be interesting to try pasture, hay. This rotation has given excellent results here at the Central Experimental Farm, and is one of the best rotations for Ontario, but is not as good as "Three-year Rotation" on account of the small proportion of grain.

Mr. MOORE: Shortage of straw is my greatest objection to it.

Mr. CLARK: Not so favourable as "Three-year Rotation" with me. Has any work been done on permanent pasture in Canada?

J. H. GRISDALE: Very little; but a great deal can be done, and it is about to be done at Lennoxville and also at Ste. Anne de la Pocatière.

"Five-year Rotation." Plough the pasture land about the end of August, as there is not much grass at the end of August in Quebec and Ontario. Work several times in order to get the sod to rot, and after that, ridge up. Discing is as good as a second ploughing, and yet a very cheap operation and a very satisfactory one.

Mr. MCCLARY: Which do you consider the best method, ploughing in the summer or putting the manure on the sod and ploughing in the spring?

J. H. GRISDALE: Ploughing in the spring is the proper way for corn.

Mr. BLAIR: I have found that a single disc does as good work as a double.

Mr. CLARK: I have never found it so.

J. H. GRISDALE: I would suggest that the cost of operations be published from year to year and be left as they are now, in order to compare with other years.

Dr. SAUNDERS: The main difficulty has been to fit in the cereal work with other work. The order of the rotations does not always suit the work in cereals.

Mr. CLARK: The rotation plots should be away from the cereal plots. This would be more satisfactory.

Mr. BAIRD: The work will be much easier in the future, as new land is being broken.

Mr. BEGIN: Twenty acres could be devoted to this work.

PART II.

Addresses given at Luncheons.

LUNCHEON, FRIDAY, JANUARY 15, 1915.

(Addresses given by the Live Stock Commissioner, Mr. Bright, and the Veterinary Director-General, Dr. Torrance.)

Mr. GRISDALE: Gentlemen, I think that most of us have finished our luncheon, as I notice many have commenced smoking. We have with us the Live Stock Commissioner, Mr. Bright, and the Veterinary Director General, Dr. Torrance, who have been good enough to promise to speak briefly on the work which is being carried on by the branches under their charge, to aid the agricultural interests of Canada, and to increase production of live stock in this country. I might say that the luncheon we have had to-day is almost entirely made up of Experimental Farm products, which shows what we can produce. None of us, I am sure, is lacking in patriotism. What we now need is to get the patriotism and production together for united effort. Without further introductory remarks, I will ask Mr. Bright to address you.

THE LIVE STOCK COMMISSIONER, Mr. BRIGHT: Mr. Grisdale and gentlemen,—After eating such a lunch as this, and in such a hurry as I have, I naturally do not feel like speaking at length, and Mr. Grisdale has warned me by letter that my remarks are to be brief. I will tell you then, in a few words, what the Live Stock Branch have done and are trying to do to increase live-stock production in Canada. We are trying to do this in the following ways:—

(1) By stimulating the keeping of more head of live stock.

(2) Improvement by better care and a higher finish before slaughtering.

(3) The improvement of the quality of the pure-bred animals kept for reproductive purposes in Canada.

(4) The extension of the live stock interests in those sections of the west where grain growing has been almost exclusively pursued.

For the last two years, we have been pursuing the policy of furnishing to associations of ten or more farmers, pure-bred

sires, the association being responsible for the proper care of them only, the ownership and control remaining with the Government, who deliver the animal to the station nearest the association. The association may renew their loan of the animal at the end of a year, and again for one more year. It is aimed to place pure-bred animals in those districts where hitherto most of the breeding has been from scrubs. The effect of our policy has already been seen in the case of hogs, where results are more quickly obtained. This year, the production of hogs was almost greater than the capacity of handling them, unfortunately, especially in the West where storage and abattoir facilities are comparatively small. As a result, hogs sold at a rather low and unprofitable figure during the last two or three months of the year. We must endeavour to guard against this another time, and this year, in fact, we sent out a letter warning the producer of the trouble likely to occur from this excessive marketing at the one time. It is, however, a very general occurrence at that time of year, especially in the newer parts of the country. Men got discouraged, and many sows were sent to market. There will be a smaller production of hogs next year. I am informed by drovers that half the hogs now being marketed are sows.

We must try to overcome this setback and make up for it in other sections of Canada, for now is the time for us to keep more stock.

The Live Stock Branch has placed five or six hundred pure-bred bulls, six or seven hundred boars, about the same number of rams, and 125 stallions, in various parts of Canada. The work with horses really commenced last year, as the first steps were taken too late the year before for much breeding to be done. It was found that in districts where there were plenty of stallions only about half the mares were being bred. The reason was that tightness of money affects horse breeding before any other class of live stock, and there was lack of interest in horse breeding in many sections last spring for this reason.

Now war has broken out the situation has changed and there are lots of horses needed. In the development of the West, there are not enough horses available. Horses which are not much good on the farm are being send to the front, and I would say that Canada is well rid of the lot of them. (Laughter.)

There is one thing I would say, although perhaps as a Civil Servant I should not discuss breeds, and that is that the war will not last forever, and I do not think that we should get into the way of breeding remounts, which at present seems to be a very prevalent idea. It will be a Godsend if our farmers get rid of this remount notion. Our motto should be "Breed the horse which will be useful to Canada," and our cry should be "Patriotism and Production." (Applause.)

The policy inaugurated last winter by the Hon. Mr. Burrell was intended to afford assistance to our more newly-settled districts. In the older sections we find that good mares and imported mares and good imported mares are not being bred to stallions good enough to make the progeny better than the dam. It is a mistake to breed to a stallion where there will be no improvement in the progeny. Our system in Canada differs from that in the Old Country. Our stallion fees are small here and do not pay for the expense and risk of sending a good horse any long distance from home.

Our policy in this matter will be announced in the immediate future and will be as follows: Farmers in any section may band together and hire a stallion of any breed provided he is sound and registered in our National Live Stock Records. The Federal Association will take 25 per cent off the fees for service. This will come into effect this year, as it was too late last year to put it into effect.

These are the lines we are following towards the improvement of the quality of stock. We are also trying to persuade the farmer to take better care of his cattle and finish them better. There are enough cattle in Canada to-day, if finished off in the best way, to produce twice as much beef as we are now producing, and we should produce a higher percentage of beef and less bone. Lots of animals are marketed not half finished, and the additional weight gained in finishing them would be practically all beef. We thus lose in production. But the prices which will prevail will make up for some of this loss. We are doing all we can to induce our farmers to wake up to the situation and take the profit for themselves. I have spoken in only a general way, as I do not wish to take up too much of your time. I can only repeat in closing that the policy of the Live Stock Branch at the present time may be summed up in the expression "Patriotism and Production." (Applause.)

Mr. GRISDALE: I think we have had an opportunity of getting a fair grasp of what the branch under the charge of Mr. Bright is trying to do. I would say that if any of our Superintendents are not on the mailing list of the Live Stock Branch, I would advise them to have their names put thereon without delay.

We have also with us to-day the Veterinary Director-General, Dr. Torrance, the work of whose branch is of an exceedingly important character. Upon his attention to duty and control of the situation depends the health of our live stock. We all know that there is a good profit in live stock if we are careful, but that there is a big loss if we go wrong. Dr. Torrance will tell you how the live stock situation is being handled in Canada to-day, with a view to maintaining the health of our domestic animals.

Dr. TORRANCE: Mr. Grisdale and Gentlemen,—In discussing some of the features of the work of the branch under my charge, I shall tell you something of what we have been doing towards keeping out the foot-and-mouth disease, although I do not wish to be considered as being like the politician who was suspected of having the disease himself because every time he opened his mouth he put his foot in it! (Laughter.)

A great part of our work lies at present in combatting the foot-and-mouth-disease, originating in the United States last August, and preventing its entry into Canada. When the disease appeared in the United States the State Veterinary sent parts from affected animals to the Federal Department at Washington, where examination was made. The diagnosis made by the Federal authorities was that the disease was not foot-and-mouth but *stomatitis*, which occasionally produces somewhat similiar sores to the former. Soon after, the disease spread, and it was proved by the State veterinarian that it was transmitted by the saliva from infected animals. After a further examination, the Federal Department declared it to be foot-and-mouth disease.

The chief of the Bureau of Animal Industry at Washington communicated with me, and I was present at the official diagnosis made in the neighbourhood of Niles, Michigan. This is a mixed farming district and the herds are small, averaging about twelve head. We found a large number of cattle affected

with similar symptoms; the animals would smack their lips, would refuse food, or eat much less than the normal amount; the mucous membrane of the mouth would contain numbers of blisters, on the tip of the tongue, the cheeks, and gums. Upon the bursting of these blisters a sore would remain. These blisters were sometimes found on the muzzle and udder. The foot symptoms were not so frequent, but the skin just where it joins the hoof was sometimes found to be bleeding. The cattle affected persisted in lying down; if obliged to move they gave every evidence of lameness. The diagnosis made was that the trouble was contagious foot-and-mouth disease.

A quarantine was immediately placed by the authorities at Ottawa on the states of Michigan and Indiana. It was the opinion of the Federal authorities at Washington that the outbreak was confined to its point of origin. I doubted this myself, as the trouble had been permitted to spread without check from August until October 15, or about a month and a half. It turned out that the disease had spread more widely than expected. You are familiar with the outbreak at the Chicago Stock Yards, which resulted in their being closed and all affected cattle there being slaughtered. Nine hundred head were buried in a single grave at the one time. The stock yards were thoroughly cleaned and disinfected. The disease has been found in one state after another, until some sixteen have been found to contain cattle affected with the disease. The Federal and State authorities have co-operated in fighting it. All affected animals, and all others which have been in contact with them, have been slaughtered and all premises disinfected. The process is till going on, but there was a fresh outbreak only last week, and the American authorities are still far from having stamped the disease out.

Soon after our first embargo, we placed one against the whole United States, which is still in force. The prohibition extends against the importation into Canada from the United States of all cattle, sheep, swine, goats, and all wild ruminants, such as deer, etc.; horses are included as well. The importation of all animal products is also prohibited.

This original embargo was found to be so far-reaching in its effects as to cripple some of our industries, such as the manufacture of leather and woollen goods. As a result, the original

embargo has been modified to permit of the importation of hides for the manufacture of leather, and of wool for manufacture, and it may be still further reduced gradually. Some horses have been admitted, as they are not susceptible to the disease, although they may act as carriers of it. Those admitted have been admitted for certain purposes, such as breeding or racing, and only after due precautions have been taken in ascertaining that there was no danger of spreading infection. The owner has been obliged to disclose all particulars about the horse imported, such as where the animal came from and where going to, etc., before we would issue a permit.

We have so far been fortunate enough not to have a case of the disease in Canada during this outbreak in the United States, and we hope to be able to keep it out. It would be a most serious thing if it were to get a foothold here, and the loss would be almost incalculable. It will be hard to free the United States of it, and they will be up against the problem for a long time. It has not yet reached the ranges. If it does it may remain, and the prospect has occasioned alarm, as it might mean the loss of the trade with Europe for all time. Foot-and-mouth disease is prevalent more or less in Austria and Germany all the time; it is epidemic, or rather epizootic, there. Consequently, importations of animals from Europe must be guarded against, and no ruminants are brought into Canada from Europe, and from England only when that country is free from the disease.

There is a very interesting article by Professor Law in *Farm and Dairy*, an agricultural paper in the United States. Professor Law is one of the oldest veterinarians in the United States, and his works on veterinary science and agriculture are well known. He says that the United States authorities are making a mistake in slaughtering infected animals, and that in Europe they are treated by isolation of the farm where the infected animal is found. When the animals dies or recovers, the restriction is removed. He states that in 1870 the disease appeared in the United States, having been brought in from Canada, and that it invaded Connecticut, Massachusetts, and Maine, finally disappearing. Infected cattle were not slaughtered during this outbreak. The statement was new to me, and I made some investigations to ascertain its correctness. I found in the records of correspondence dated 1870 that the attention

of the Government was called to the new regulations governing the importation of cattle and hides. Letters were written to the Governments of Ontario, Quebec, and the Maritime Provinces. Each replied that all inquiry has been made, and that there was no record of the foot-and-mouth disease in their respective provinces. Dr. Smith, President of the Ontario Veterinary College, was asked to investigate the matter in Ontario. He replied that there were no contagious diseases in the province of Ontario, but that cattle had suffered unusually that year from the attacks of flies, which had been extremely numerous, owing to the peculiar season, and that by scratching and rubbing themselves they might occasionally have made sores, but that there was no evidence of the presence of foot-and-mouth disease.

Our records, therefore, do not show that Prof. Law is correct in the statement that the outbreak of 1870 in the United States came from Canada. The rest of his article as to the disappearance of the disease is probably correct.

I discovered that there was an outbreak of foot-and-mouth disease in Canada five years later, in 1875, in Ontario. This was traced to importations from the Old Country, there being no quarantine facilities at that time for animals which had been certified as being in good health when exported. These animals had communicated the disease, and the outbreak in Canada was the consequence. An association in Ontario took up the matter of better quarantine in Canada, and asked that we approach the United States authorities with a view to having passed similar regulations. At the Centennial Exhibition, no valuable animals were shown owing to the outbreak. Senator Cochrane, a breeder of Shorthorns, signed a petition for the establishment of quarantine stations in Quebec and the other provinces.

There has been no foot-and-mouth disease in Canada since that time, and I hope we will remain free this time.

I will not take up your time further by discussing our other activities. We have in our charge the laboratory for the manufacture of tuberculin and mallein, and also the Meat Inspection Service. As our laboratory is situated on the Farm here, I should be glad to have you see it. Dr. Higgins is in charge.

We have also charge of the quarantine stations at our ports of entry, such as Quebec, and new ones are being established and old ones changed so as to be more conveniently situated to the railways. New buildings are being put up and old ones moved, fencing put up, and everything done to enable us to take care of the importations of next season.

In conclusion, I would say that I am glad of this opportunity of greeting old friends and of meeting those whom I shall regard as old friends the next time I see them. (Applause.)

Mr. GRISDALE: We have all listened with interest, I am sure, to Dr. Torrance's account of the outbreak of the foot-and-mouth diesase in the United States. If anyone has a question to ask, I am sure Dr. Torrance will be willing to reply.

Dr. TORRANCE. Yes, certainly.

Mr. FAIRFIELD: Is poultry for breeding purposes admitted without restriction?

Dr. TORRANCE: Yes.

Mr. FAIRFIELD: You stated, I believe, that the foot-and-mouth disease had not yet appeared on the ranges. I have noted in the papers that it has been found in one of the western States? I should be glad to know that this report was unfounded.

Dr. TORRANCE: A carload of steers was shipped from Chicago and, when they finally reached their destination, they were found to be affected. Two counties of the state have been quarantined, and there is no evidence that the disease has got beyond this.

Mr. MACMURRAY: Is the disease more prevalent in the northern or southern districts?

Dr. TORRANCE: I should be of the opinion that the severe winters and frost of the north would lessen the duration there.

Mr. MOORE: The cattle in the National Dairy Show stables were not slaughtered?

Dr. TORRANCE: These numbered about 800 head, and were of great value, some of the bulls being valued at $10,000 each. They represented an amount of money greatly in excess of what the compensation would have been had they been slaughtered. As a consequence, all remained in quarantine in a big building there, where they are still confined. The disease ran through them all, and some have had it three times. I only know of one Canadian herd there. When owners of

these cattle wish to ship them home, they are opposed by their state officials.

Mr. HUTTON: As one of the Superintendents, I wish to express my appreciation of the opportunity afforded to hear the Live Stock Commissioner and the Veterinary Director-General. It has given us all great pleasure. At various times, we have to refer matters to the branches under their charge. For instance, one man, whose knowledge of English was limited, wrote saying he was sending me a box of meat, that many of his pigs were dying and he wished me to see if the meat would affect children? This was one line of work which I left undone. The material was sent to the Health of Animals Branch for examination, the pigs were found to be suffering from cholera, and the herd was slaughtered.

I have pleasure in moving that a vote of thanks be tendered these gentlemen for their addresses to us.

Mr. MOORE: As a semi-live-stock Superintendent, I would say that we are not all so unfortunately situated as Mr. Hutton. At Agassiz, we have a laboratory under charge of an excellent officer of the Health of Animals Branch, Dr. Hadwin. When we receive such specimens as Mr. Hutton described, we try it on the guinea-pigs!

I have pleasure in seconding the vote of thanks proposed by Mr. Hutton.

Mr. GRISDALE: Gentlemen, you have heard proposed and seconded that a vote of thanks be tendered the Live Stock Commissioner and the Veterinary Director General for their kindness in giving us these addresses on their work. If you approve, will you kindly signify in the usual manner. (Carried.)

Dr. TORRANCE: Mr. Bright and myself both thank you for your expression of appreciation. Like other employees of the Government we have tried to do our duty. You have shown that you have not been too seriously inconvenienced by our remarks, and I trust we have said nothing which might better have been left unsaid. There is one other thing I might mention, if you will pardon my taking the time, and that is with reference to ergotism in cattle. The disease is not common, and reported cases of it are largely imaginary. However, there is evidence of cases of it and even of death resulting therefrom. I will read a letter received from Inspector McKenzie, of Alberta:

ERGOTISM.

Inspector McKenzie, of Alberta, reports that on January 4 he visited the farm of W. P. Taylor, Carstairs, Alta, E. ½ 5–30–27 West 4, and found a herd of ninety (90) head of cattle, twelve (12) of which were suffering from ergotism. Necrosis of the inferior third of the tail, about one inch of the superior extremity of the ear, and both hind feet, was observed in one animal. In two others, both hind feet had sloughed off at the pastern joint; in another an indented ring circumscribing the hind leg about 6 inches above the fetlock joint, below which the tissue was gangrenous; in three, one claw was absent.

The other visibly affected animals exhibited swellings and lameness in one or both hind fetlocks.

The animals had access to stacks of rye straw since about November 1. Owner advises that first symptoms were observed on or about the 1st of December.

Inspector McKenzie advises the owner as to treatment of animals only slightly affected, and to burn all rye stacks.

The same day he visited the farm of Knud Christiansen, 10 miles east of Carstairs, and found a herd of thirty-four (34) cattle, six (6) of which were showing the effects of ergotism, being lame, having enlarged fetlock joints, and lying down continuously.

The grain bins and rye stacks were examined and a considerable quantity of ergot found. The animals had been feeding on rye straw for four weeks, and a slight lameness was first observed ten days ago.

Mr. Christiansen informed him that a neighbour, who had fed rye to pregnant sows, had twenty-eight (28) abort. All rye straw was burned, and the owner instructed to thoroughly clean the rye grain before feeding.

I have also a sample here of ergot on rye, which I will pass round for your examination.

Mr. CLARK (Charlottetown): In Prince Edward Island, wheat, barley, and the grasses, although rarely timothy, are attacked by ergot. What would you suggest?

Dr. MALTE: Mr. Clark mentions ergot on timothy and wheat. In the West, especially in Alberta, I found it extremely common on the grasses. Round Calgary, I found it on brome grass lately introduced, but none on rye grass. In other districts, the brome grass was free, but there was plenty on the rye grass. In other places, specimens of ergot were found on the clovers, but not on rye. Is there any evidence to show that ergot of the grasses has the same effect as ergot of rye?

Dr. TORRANCE: None.

Mr. GÜSSOW: The sclerotia on the grasses are smaller; hence it would be necessary to consume a larger amount to produce the same effect.

Mr. GRISDALE: It is very common on the wild grasses.

Mr. GÜSSOW: It is very common in Europe.

Mr. GRISDALE: I would announce that as we are not going to have a general meeting to-morrow afternoon, I wish to add to the programme a meeting on Monday evening at 8 o'clock, in the Auditorium. I should like to have present all the Superintendents, our principal officers here, and any of their assistants, who can come. If any one has any subject to add to those on the programme for these meetings, any special topic he wishes to see taken up, I should be glad if he would bring it to our notice at that time. We may also have a meeting to-morrow night. I shall decide on that in the morning. We are meeting here this afternoon, and those who do not care to remain may now leave and allow Mr. Watson to discuss our exhibition work throughout Canada. At four o'clock, certain of our Superintendents will discuss fertilizer work with Dr. Shutt in the Chemical Laboratory, while I will meet the Superintendents of the prairie Farms at that hour, in my office. I think that is all.

LUNCHEON, SATURDAY, JANUARY 16, 1915.

(Addresses given by the Dairy and Cold Storage Commissioner, Mr. Ruddick, and the Seed Commissioner, Mr. Clark.)

Mr. RUDDICK: Mr. Grisdale and gentlemen.—This gathering here to-day reminds me forcibly of the great progress which has been made in the work of the Department of Agriculture since I joined the staff in April, 1891. At that time the Dairy branch consisted of the Commissioner, Dr. Robertson, and a stenographer. I was the first appointee, more or less expert, generally less expert, to the staff of the branch. The Dairy Commission at that time occupied jointly one small room with the Horticulturist. That gives you an idea of the extent of the staffs at that time.

Some years afterwards, Prof. Robertson, as he was generally known, resigned his position at the Central Experimental Farm and his headquarters were removed to the Department in the city. The work of the branch began to grow, and about 1900 it was organized into divisions, and at that time it included the Divisions of Live Stock, Poultry, Dairy, Seed, and Extension of Markets. Later on, when Dr. Robertson resigned his position, the branch was reorganized.

The Seed Division was raised to the status of a branch, under Mr. Clark. The Live Stock Division was separated also, and it left with the original branch the Divisions of Cold Storage, Dairy, Extension of Markets, and Fruit. The Fruit Division has gone; so that to-day what is known and always has been known, as the Dairy Branch, consists of three divisions, namely, Dairy, Extension of Markets, and Cold Storage. Now, I had intended to say something about the dairying industry in general; I shall be very brief on that point. The last census shows that there were in 1911, 2,594,179 cows in Canada. That shows an increase of only some 185,000 during the decade since the previous census; the production of milk, however, had shown a very large increase during that period, owing to the improved cows. The improvement in stock resulted in the greater yield of milk, and I have some figures which I thought might be of some interest to you on that point. If you will allow me, I will read them:—

The total production of milk, that is, converting all the products back into milk, in 1901, was 600,866,000,834 pounds. Billions do not convey very much information to my mind, but in 1911 the quantity had shown an increase to 900,871,000,000 pounds or an increase of 43 per cent in the production. The per cent of increase in stock was 7. The total consumption of milk, you understand, had increased during that period by 74 per cent, and the per capita consumption of milk and its products had increased by 30 per cent. Nowadays, butter is better and you spread it thicker. One of the leading merchants in Montreal told me the other day that he believed that the consumption of butter in Montreal had fallen off 30 per cent in the past six months, because of the condition of the buying power of the people. There was a good deal more export in the preceding decade. The exports of 1901 as compared with 1911 show that the decrease in the exports was 11 per cent; if you take the preceding ten-year period the increase would be greater. Over a million more cows would have been required to produce that much more milk at the old figures. I estimate that our present production of milk is valued at somewhere between $120,000,000 and $130,000,000. The home consumption is something over the $100,000,000 mark at the present time, and our exports of milk, cream, condensed milk, and cheese, and a small quantity of butter, last year amounted to about $20,000,000, so our home market is much the more important to cater to. These export figures are the only ones which are available from year to year, so that very little attention was paid to the home trade, there was very little idea in the mind of the average man as to what it amounted to, and the general impression became current that the dairy industry was declining. We require our milk products for home consumption—take the matter of ice cream alone, that has developed largely in the past ten years.

I was surprised to find that the amount of cream used for the manufacture of ice cream was equivalent to about 11,000,000 pounds of cheese, and that was a development at that time within the past four years. It is estimated that the rate of increase per annum is about 20 per cent.

In many ways the consumption of cream has increased enormously. We have got to have cream now.

The increase in the number of cows in Canada is entirely in Western Canada, and especially in the provinces of Alberta and Saskatchewan, and it may be of interest to know that the total value of the milk produced in those provinces in 1901 was $1,500,000, and in 1911 was $15,000,000, and it is to Alberta and Saskatchewan, and possibly to Manitoba, that we have to look for the greatest development of the dairy trade in the future. I do not think it will be very long until these provinces have a surplus over what is required in the West.

Last year we imported about 6,000,000 pounds of butter from New Zealand to Vancouver alone, and some also came in via England to Montreal markets. After all, it is a matter of geography, for you can bring butter from Wellington, New Zealand, to Vancouver cheaper than you can from Montreal to Vancouver—fresh butter—at all times, and that competes with store butter from the East. New Zealand is depending entirely on the export trade and markets which will always be fixed by the international values, while our prices for butter have been away above international values, because we have not had any for export.

I believe I am expected to tell you something of how the Dairy Branch tries to help this industry at the present time. One of the most important lines of work which we have in hand is that of promoting the keeping of dairy records: encouraging the owners of herds to weigh and test the milk of their cows in order to get accurate records of the individual production. This work was started in a small way in 1904, but it was not until 1906 that it was organized on the present basis. At the present time there are thirty-five men employed who give their whole time to this work, in charge of what are known as dairy record centres. These are distributed throughout the Maritime Provinces, Ontario, and the western provinces. These men devote all their time to encouraging the farmers within a limited area of 10 miles, visiting them and sending the records of milk, butter, etc., in to the department monthly, and also at the end of the milking season.

In addition to these are smaller associations where some cheesemaker or any person who is competent undertakes to test the milk for the farmers in the neighbourhood. We supply them with the chemicals, and pay the person who does the testing, at the rate of 5 cents per test.

We also send out to any person who asks for them, any blank forms that may be required for keeping records of their own herds. This method of organizing dairy record centres is rather a difficult point. Logically, if you are going to test one man's milk you will have to test every man's milk, which would run into hundreds of thousands of dollars of expense, and it would be hard to get the appropriations for it; besides, we find that once a man gets interested in it, he prefers to keep the records himself rather than be along with others, and he has the idea that making the records more or less public is giving away records which may be useful to him.

It is impossible to estimate just to what extent this work may have affected the production of milk, but I might remind you that during that ten-year period which I referred to before, the daily production of milk was increased about 10 pounds per cow throughout Canada. It would be absurd for me to claim that this increase is due entirely to the milk-testing campaign, but I believe that a great deal of it is due to it; the farmers are encouraged to pay more attention to the breeding of their cows. I believe that a great deal of the increase of production of cows is in the feeding and breeding of cows.

I remember when I was a boy at home that it was quite a common thing for the cows to come through the winter so weak that they had to be lifted in the spring. I remember hearing John Rudd telling a story about his father He said that his father was a little advanced over his neighbours, and at that time it was the custom to leave the cows out in the bush the whole winter long and they fed on the small tender shoots of the trees, which is called browsing. His father thought it would be more comfortable for his cows to be in the stable over night, but he put them into the stable and drove them back to the woods after dark so that his neighbours would not laugh at him.

We have a dairy station down at Finch. We, two years ago, got an option on two old cheese factories not more than 2 miles apart. After getting an option on the factories we called a joint meeting of the patrons and told them what we proposed to do: to put up a good modern building; and they finally agreed to patronize it. We are running this place as a model cheese factory. We demonstrate the advantages of

a certain construction of building. We are also able to determine the value of different kinds of apparatus, and we also have a place where we can conduct the testing of milk, butter, and the pasteurization of milk, etc. We are, with the equipment which we have and the facilities, able to ship cream and milk to Montreal and other points in the winter time.

This factory at Finch is a combined factory; we can make butter or milk or cheese, pasteurized milk or pasteurized cream at an hour's notice, and that is the modern requirement for a factory in this part of the country, where there is a good market for milk, at certain seasons of the year for milk and cream, not only in Montreal but in Ottawa, and there is a certain demand for milk and cream to ship across the border. The operation of these factories keeps us in touch with the practical difficulties which the factoryman meets with in his day's work.

I think it is worth while to have a place which can deal with the everyday work of the factoryman. We have been working a little during the past season on the question of the cheese value of milk. That has been a burning question in Ontario for a number of years, and when we took hold of this place down there they were paying for the milk on the old method of pooling.

We thought that it was hardly right for a Government institution to be operated on an out-of-date plan like that, so we encouraged the patrons to place the value of the milk on the fat test. There was considerable dissatisfaction; some of those who had had poor percentages of fat in their milk did not like the new system at all.

After a petition had been presented signed by one-half of the patrons, we proposed the following plan: We will divide the milk test and handle it separately. Those who wish to have it paid for in the old way will have it received at one window, and the other side at another window. There was no objection to that, but when we started operations there was not a single can of milk presented at the pooling window.

They are all endeavouring now to raise the standard of their product. There will be less difference later on than there was at the time that this arrangement was entered into.

Of course there are many matters in which a branch like the Dairy Branch is interested. We have personal inter-

views, attend meetings and furnish plans for dairy buildings, cheese factories, and creameries. We furnish plans for small farm dairy buildings, for small farm cold storages and these all help.

I think that perhaps some of our most useful work is done through correspondence. We get men interested in that way and it seems to be more successful than holding dairy meetings. I believe you do a good deal more by being able to demonstrate practically how things should be done. That is where I think that this Experimental Farm system has a great advantage over the Dairy Branch where we have to depend largely on publications or dairy meetings to reach the farmer.

The Dairy Industry Act of 1913 is only an authority to make regulations concerning the per cent of water in butter, and deal with the marketing of cheese. We have found that so far the principal work in administering the Act is to prevent unscrupulous creamery men from incorporating too much water with their butter.

You may be surprised when I tell you that we have found butter with 50 per cent of water; the legal limit is only 16 per cent; 36 per cent is quite common. There was a man in Montreal fined $200 and some $150 costs. He was not able to raise the money, and was sent to jail. They tried to get him off, but I insisted that this man should be punished. He is just as much a thief as though he took the money out of your pocket.

We have had the greatest difficulty in Montreal in stamping out the practice of adding excessive water to the butter. It seems a very important thing to prevent it, otherwise you would be getting as much water as butter.

The method of adding water is comparatively simple. They buy up butter—a great deal of this being very poor quality—slice it up in thin pieces, put it in the churn, cover it with warm water so that it softens the butter, leave it over night, give the churn a few turns, which makes a sort of sludge, then pour it into a mould where it solidifies. When it is cold it can be cut. In that way you would be surprised how much water they can get into butter without showing any leakage. It will hold 35 per cent of water, and not leak at all. That is the only difficulty which we have had so far in administering

these dairy laws. There is a requirement now that all dairy butter, if it is put up in pound prints or 2-pound prints, must be put up in parchment paper and must be printed as dairy butter; the reason is that a large number of dealers get a lot of dairy butter, work it up and brand it as creamery. We have been rather lenient with them until they work off their old stock of wrappers, etc. Then there is another method of branding that affects Ontario particularly: A great many cheese factories have been skimming their whey and getting about 2 pounds of butter to 1,000 pounds of whey. This butter never has the quality of genuine butter, although it is genuine enough because it contains the residue of butter fat in the whey. However, this butter is of very poor quality, and seldom cleanly. It is required now that all whey butter must be wrapped or advertised as whey butter.

Another important division of the Dairy Branch is the Extension of Markets Division. The work of this division is probably less known to the general public than any other line of work which we carry on, although it is probably the most important which we have carried on in the past fifteen years. We have originated car services at various places to carry butter, cheese, and even fruit.

In shipping anything in refrigerator cars you cannot ship less than a carload. You must have either a carload or else ship it in an ordinary car. We only guarantee the railroad company two-thirds of the earnings of the minimum car. In most cases there is a carload before the car reaches its destination, and there is not a very great demand on the division for this deficiency.

Now then, in order to see that these services are properly performed we have inspectors employed who travel over the various roads and advise the shippers in various ways. The inspectors see all the cars as they arrive at the terminus, and note the condition of the butter or cheese, or whatever may be in the cars, and make a note of the quantity of ice in the bunkers. If there is no ice it is a guarantee that there will be no payment made for that car.

It is part of the duty of our cargo inspectors at the wharves at Montreal to supervise the loading of all perishable goods such as butter, fruit, etc. This is followed up by a report

from four of the principal ports of the United Kingdom on the condition of the cargo when it is unloaded. When we compare the reports we know where the blame lies, and can get after the shipping company. I know some ships that lost their entire cheese trade during one season, because of their failures to carry cargoes in good condition.

We use recording thermometers, thermographs as they are called, and sometimes put as many as half a dozen thermographs in different compartments of the ship. Then the inspector in Great Britain takes the information off the instrument, sends it to the office and we take blue-prints, using the chart as a negative; the blue-prints are sent to the interested shippers, the engineer of the ship gets one of them, and any one interested by applying to the department can get one.

We send these thermographs down to Australia and New Zealand with fruit, etc. We sometimes lose one, but they finally get back to us. We have only lost, in five or ten years, something like two or three thermographs, and we use two or three hundred. The instrument makers say that they have no other users using the number that we do. This apparatus costs us laid down here about $45 each. We have bought them through Carcella & Co., 26 Rochester Row, London, Eng. There are a good many different kinds; there are a number of American machines, but we have not found any of them which are of the worth that these are. They are in a perforated case, which is locked up; it cannot be tampered with. With butter they are just simply stowed in with the cargo, packed away. When the first one arrived in Liverpool and the men came across this thing ticking they all cleared out; they thought it was an infernal machine.

There is another machine called the impactograph. It is so devised that it records shocks, and when they get the record back they can tell how many times it has been turned upside down, and how hard it has been jolted, etc., and they are getting after the express companies that way, by putting it in an egg-case or in a box of fruit. Of course the thing gets rather badly used; the mechanism is delicate, and they have not yet got it perfected.

Now we come to the last division of our work, and that is the Cold Storage. That will be interesting to you. We have

been paying a bonus for a good many years to the creameries which have proper accommodations for their products. This bonus is paid only once to the creameries. Nearly every creamery in Canada has received a bonus. It is the administration of the Cold Storage Act which provides for the payment of subsidies to the public cold storage works. Some one has to visit the locality of these works before recommendation is made for the payment of the first instalment of the subsidy, and inspections are made yearly during the period when the subsidy is payable. Sometimes we do not pay 30 per cent on the whole cost, but on the approved cost. When we think money has been spent unnecessarily, the grant is cut down.

Now, Mr. Grisdale, I have prepared, but I find that I have only two or three copies of it, a short statement of the work of the branch. I think that that will give you in a much better and more concise form the activities of the branch than I have been able to give you to-day. (Applause).

(Note.—See Part III for this statement by Mr. Ruddick.)

THE SEED BRANCH.

Mr. Clark: It is fortunate that this conference of Experimental Farm Superintendents is held at this time. Farm industry is now undergoing somewhat of a transition, and the men who are here assembled will have much to do in their respective districts with moulding the opinions of farmers during the readjustment of affairs, which is bound to take place in its own good time, and should take place as soon as possible.

Unfortunately, farming during the last ten years or more has been less attractive to young men of good ability and to capital than have other industries, in urban centres. The problem of farm labour has been an exceedingly perplexing one and, in consequence, farm systems have been modified so as to require the minimum of labour, for the maximum yield of net returns. City industries have completely outbid the farm in the matter of labour, and it is probably true that at least one-third of city workingmen have had experience in farming. I would like to say to those men now that if the opportunities in the city looked brighter during the past ten years the next ten

years, in my judgment, assuredly belong to the farm, and the sooner they realize that the better for themselves and for all concerned.

One of the most difficult problems that present themselves to all who are working for the improvement of agriculture is how to reach the indifferent farmer. Does it not often happen that the precept and example set by leaders in agriculture are too far in advance of, and not at all helpful to, the man who is struggling under a heavy load and whom we would rate below average as farmers go? Is our work as carefully planned as it should be, to be of the greatest possible help to these so-called indifferent farmers? Have they not been largely neglected in our thoughts and activities?

SEED INVESTIGATIONS.

I have had frequent occasion to consider resolutions presented by farmers' organizations, asking that the Government prohibit the sale of seed grain and other seeds unless they are absolutely free from weed seeds. Such resolutions express an ideal that is cherished by few and practised by none. We believe it to be of the greatest importance to base our educational work and legislation primarily on the actual conditions we find among farmers as a whole. Ten years ago, prior to the enactment of legislation to control the commerce in seeds, we conducted an investigation to ascertain, so far as possible, the actual conditions of the seed trade and of the quality of grain and other seeds used by farmers on their own land. We have just repeated that investigation with results that are both encouraging and disappointing—encouraging because material progress has been made, and disappointing because the seed grain now used by farmers is so far short of the ideal.

Thirty-seven hundred samples of seed grain were taken by our regular inspectors out of the seeders or seed supplies used in planting by farmers on the concession lines in localities that were selected as being representative of each of several districts in all the provinces. Of these samples, 34 per cent came from farmers who did not know the names of the varieties they were sowing. There were thirty-two variety names of

oats, the motley mixture being most notable in Ontario; 75 per cent of the farmers were using seed grain grown by themselves; 25 per cent of the seed had been purchased either from neighbours or from dealers. The farmers of the Prairie Provinces understood and practised the treatment of grain to control smut. If the farmers of Eastern Canada understood that treatment, they did not practise it, and there is abundant evidence that the losses due to smut, particularly in the oat crop, are very large. Eleven per cent of the grain sown last spring, taking the average for all Canada, had received no cleaning other than that given by the threshing machine, and the cleaning that had been given to most of the samples had assuredly been very inefficient. We find that while fanning-mills are fairly well distributed in Eastern Canada, few of them have an equipment of riddles and screens competent to do anything worthy of being called seed cleaning.

The purity of the seed, taking the average, was decidedly inferior. Taking the average rate of seeding reported for the different kinds of grain, the number of weed seeds distributed, taking the average of all the samples collected, on each square rod of land sown, was: for oats, 40 noxious and 130 other kinds of weeds; barley, 25 noxious and 260 other kinds; wheat, 49 noxious and 214 other kinds; and flax, 140 noxious and 760 other kinds. This is a regrettable condition of affairs, and not at all complimentary to our Canadian agriculture. There is a grain of satisfaction in saying that it is not as bad in some respects as it used to be, but in other respects we know it is worse. Noxious weeds were much more widely distributed in 1914 than they were in 1904. What can be done to improve those conditions? I need not remind you of the tremendous benefit that would accrue to the farm industry were all the seed grain used in Canada as good as that used on the Experimental Farms over which you have control. Nine years ago I succeeded in instituting, for the first time in Canada or elsewhere, so far as I know, a plan calculated to reach the very conditions I have mentioned.

FIELD CROP COMPETITIONS AND SEED FAIRS.

Field crop competitions were organized and conducted for the first time in the Prairie Provinces in 1906. Seed fairs and

provincial seed exhibitions had been started in previous years. Last year we put in $50,000, along with an equal amount of provincial funds, to be used in organizing and maintaining these institutions which have for their object the encouragement of the production and use of better seeds in general farm practice. Last year, 153 seed fairs, 11 provincial seed exhibitions, and 350 field crop competitions were held. I can only tell you that, combined with various other factors and forces which are operating to the same end, these organizations have exerted an exceedingly wholesome influence.

The Canadian Seed Growers' Association is supported by a grant of $7,500. Their farmer members make a specialty of seed growing, and most of the registered seed they produce is sold to farmers who compete for prizes in field crop competitions. The amount of high-class seed produced by members of this association, plus the amount made available by the Experimental Farms and the good seed sold by seedsmen, properly so called, is an exceedingly small part of the seed purchased by farmers. It is a matter for regret that the grain trade has not available in quantity, a quality of grain, particularly of oats, of a purity more desirable for seeding. The great bulk of the seed oats supplied by commerce in Eastern Canada comes out of the large terminal elevators at Port Arthur and Fort William. The best grade of oats when mixed in those bins contains from 100 to 150 wild oats to the pound. Since nearly one-tenth of the whole grain-crop of Canada is needed for the next year's seeding, it would seem reasonable to expect that in handling this grain for commerce a sufficient quantity of the cleanest and best as it comes to market would be kept apart in separate bins and made available for that purpose. A grade for oats suitable for seeding would do much to eliminate the motley mixture of varieties now prevalent throughout Eastern Canada, and would be effective in improving the crop.

TIMOTHY SEED.

Two-thirds of our timothy seed is imported from the United States. More than 2,000,000 bushels are produced in the state of Iowa alone, on land that has a selling value ranging from $75 to $150 per acre. The seed we import from

the United States is small of kernel, usually badly hulled, but clean. The best timothy seed I have ever seen was grown in Alberta. It was very large in the berry, had a bright silvery lustre, and was almost pure. There are hundreds of thousands of acres in northern Alberta, Saskatchewan, and Manitoba that is a little too moist and too fertile to mature cereal crops, but on which timothy seed may be grown to perfection. I hope that in the near future the farmers of the Prairie Province will grow, not only enough high-quality timothy seed for their own use but also enough to spare a few hundred carlots for the eastern provinces. But I would suggest that they will find a dull market for anything but a No. 1 quality of seed.

CLOVER SEED.

In a normal year we produce in Ontario twice as much red clover and three times as much alsike seed as is required for home consumption. Northern Ontario, in the district of Rainy River, has now entered into the production of clover seed with excellent success, and I expect that in future our clay belt in northern Ontario will supply a considerable proportion of the world's red clover and alsike seed. The land I saw from lake Abitibi westward along the line of the Transcontinental is superb for the production of forage crops, and we have already had demonstrated to our satisfaction that the land in the clay belt and farther north and west is excellent for the production of forage seed crops. The province of Quebec has also made progress in the production of red clover seed, and the farmers there are just awakening to their opportunities in that direction. The red clover seed crop is always a precarious one, but it is less so in the province of Quebec than in Ontario, where red clover seed has formed one of the moneymaking crops for many years. During the ensuing year our farmers would be well advised to increase their areas of red clover seed, because in the normal year the United States is a large importer, and the supplies formerly obtained from Europe may be produced to good advantage in Canada. On the other hand, Europe is the natural market for American-grown alsike seed. We used to say that the Toronto market controlled the world's prices for alsike seed. For the next

few years it would be well to save alsike seed only from the best and cleanest fields, and to increase the red clover crop to take the place of the surplus alsike.

ALFALFA.

Among forage crops, alfalfa promises to take a foremost place. In past years we have been obtaining alfalfa seed too largely from southern climates. The crop produced from these tender strains will not stand our Canadian winters. Yet in spite of this, the area devoted to alfalfa has greatly increased. Ontario has grown some seed, but in the climate of Eastern Canada the crop seems to be extremely precarious. There is no question that the fertilization of alfalfa in southern sunny Alberta is all that could be desired, and in future I anticipate that the seed for all of Canada will be grown in the western provinces. If they produce and supply seed of only the best and hardiest strains, and take the precaution to seal it in the sack, so that farmers may know they are getting the genuine article, there is no doubt that the area devoted to alfalfa in all parts of Canada will rapidly increase.

FIELD ROOT AND GARDEN SEEDS.

I believe we can now give reasonable assurance that plenty of seed of all the staple kinds of field root and garden vegetable crops will be available for planting this year. The European seed crop of 1913 was excellent, and most North American seedsmen have carried over reserve supplies. The European crop of 1914 was waiting to be harvested at the outbreak of the war, but there is evidence now that Germany, France, and other countries will make some delivery according to their contracts with seed houses in North America. We have therefore no cause for serious anxiety about our seed for 1915, but I do not know that any one would care to gamble on the areas that will be devoted to field root and garden seeds in Germany and France next year. It is impossible to estimate what may happen to our supplies for 1916. We believe that farmers and gardeners, and the people as a whole, would suffer much inconvenience from a shortage of these seeds. We know

it is not necessary that they should suffer because as good a quality of those seeds, or better, can be grown in Canada as in any other country. We believe it is necessary to have an abundant supply and that it is risky to depend on European countries. We have therefore advised the Canadian farmers and gardeners in general, and many of them in particular, to prepare to grow and select their own seeds. We have estimated that the cost of production in Canada, due to labour conditions, is somewhat greater than it is in Europe, and in order to stimulate the production of seed of superior quality, by applying careful attention, the Honourable, the Minister of Agriculture has authorized the payment of subventions to *bona fide* growers according to the following schedule:—

Kind of Seed.	Subvention per pound.	Number of pounds for which subvention may be paid.	
		Minimum.	Maximum.
Mangel or sugar beet	·03	100	10,000
Turnip or swede	·04	50	5,000
Carrots, field or garden	·07	30	5,000
Beet, garden varieties	·10	20	3,000
Parsnip	·07	10	500
Radish	·09	10	1,000
Cabbage	·25	10	400
Tomato	·50	10	100
Onion	·25	10	2,000
Celery	·40	10	100
Lettuce	·20	10	500
Cucumber	·20	10	100
Watermelon	·20	10	100
Muskmelon	·30	10	100

It is not the intention to pay these subventions unless proper care has been taken with the culture and selection, to secure purity of type and excellence of quality, and subventions will be paid only on seeds that are sold for seeding in Canada. The district officers of this branch are to assume responsibility for the details of the plan. They will inspect the seed crops of all who apply for the subventions, and the money will be paid to growers only on claims approved by the district inspectors.

SEED CONTROL ACT.

Seed-testing stations had been established in Europe thirty five years in advance of our Canadian seed laboratories. As a result, European countries demanded and were getting the best seeds produced anywhere, and those countries always had seed of inferior quality to offer at low prices. Our investigations of the trade, which were commenced in 1902 and continued for three years, made clear that we were exporting our best and cleanest seed, and using seed that could not be marketed in countries where a system of seed control had been established. In other words, our seed laboratories and Seed Control Act were necessary in self-defence. To commence with, our efforts at legislation were not radical, but they have been modified from time to time until now we believe we have the best system for controlling the trade in forage crop seeds and the vitality of seeds that is to be found in any country. The fact that 95 per cent of the grass and clover seeds used in Canada consist of timothy, red clover, alsike, and alfalfa makes the control of the seed trade a very simple matter compared with the difficulties experienced by other countries in dealing with the seeds of other grasses. We have made a system of grading akin to that applied to grain for commerce by the Canada Grain Act. The application of our Seed Control Act is, however, of necessity somewhat different. Any farmer or seed merchant having timothy, alsike, red clover, or alfalfa seed for sale may, of his own initiative, draw a sample and submit it for test and grading to our laboratory either at Ottawa or Calgary. We issue a certificate based on the sample and keep the sample on file for reference. The seed is then sold on our certificate and shipped under the certificate number. We have organized a fairly efficient system of inspection to enforce this grading. When our inspectors find exposed for sale in the retail trade seed that is graded No. 1 which they believe to be No. 2, they take a sample and send it to our laboratory under the original certificate number. When received, the sample is placed on our grading table by the side of the original for which the certificate was issued. The two samples must be comparable. We allow a natural variation of 10 per cent in point of weed seeds. During the first few years of administering our Act,

we located a few instances where a sample of good quality had been sent to us and graded No. 1 and the sender had used the certificate to ship inferior seed. But we have yet to find a man who would care to repeat that offence. We have no serious difficulty in administering the Act because we now have the whole-hearted co-operation of Canadian seedsmen as a class, and I want to say in their behalf that they are not less honourable than are men in any other vocation, including the honest farmer.

Nearly every country with experience in seed testing work had adopted standards of vitality for good seed of the respective kinds. Our investigations had shown that the losses in field and garden crops due to the use of seed of low vitality were widespread and considerable. It was our aim, as far as possible, to prevent such losses. Our investigations indicated that as a rule seeds of all kinds were sown much more thickly than was required for good results; and we came to the conclusion that if two-thirds of the seed of practically any kind of crop would grow, there was no serious danger of crop failure, so far as the seed was concerned. The provisions of our Act therefore require that when the vitality of any seed falls below two-thirds of the standard fixed for good seed of the kind, the person selling it must make clear to the purchaser what is the actual germinability of the seed.

For the enforcement of the Seed Control Act we have a chief seed inspector, Mr. E. D. Eddy, and permanent district inspectors each in charge of a definite area or province. During the busy season of the trade, each district inspector has from three to seven temporary inspectors working under his direction. Last year they visited, in all, 1,430 towns and inspected the seed exposed for sale by 4,212 dealers, a great many of them having to be visited several times. Our latest records show 839 violations of the Seed Control Act, and 75 prosecutions. I can assure you that the work of the chief inspector of seeds is not a bed of roses, but it has been conducted in a way to command the respect of the members of the seed trade as well as the farmers. (Applause.)

A vote of thanks was moved and passed to Mr. Ruddick and Mr. Clark for their addresses.

LUNCHEON, MONDAY, JANUARY 18, 1915.

(Addresses given by the Fruit Commissioner, Mr. Johnston; the Dominion Entomologist, Dr. Hewitt; and the Accountant, Mr. Chittick.)

Mr. JOHNSTON: Mr. Grisdale and Gentlemen,—I must say that I am very glad of the opportunity of coming down to the Farm to be present at this luncheon; not only to enjoy the good things which Mr. Grisdale has prepared, but also for the opportunity of meeting you face to face and talking with you of what we are doing.

You gentlemen, drawn as you are from the different parts of the Dominion, and your Director, Mr. Grisdale, are doing great work. There is, to my mind, no branch that is doing greater work than the branch which is under the direction of our friend Mr. Grisdale. We fruit-growers appreciate the splendid work which has been accomplished. The Experimental Stations which have had to do with fruit have been, as it were, landmarks in front of us, which we have followed.

The result of the work which has been done is that Canada has developed a great fruit-growing industry. I and my branch have more to do with marketing than with production. The production is in the hands of Mr. Macoun, Mr. Blair, of Kentville, and others, who are well known, and the work which they have done is well known.

We try, in our branch, to keep the fruit growers advised as to the fruit industry: market conditions, transportation, etc., and hope by and by to give them instructions which we know will be valuable in the marketing of their fruit.

Before our branch was organized the leading fruit growers of Canada demanded that there be some standard established by which the trade would be made to recognize the importance of our Canadian packers. Up to fifteen years ago, our Canadian packers packed their own apples in their own way. As a result, Canadian fruit was brought, to some extent, into ridicule. I say ridicule, because it was ridiculous the way it was packed. The western and Old Country consumers did not care to buy unless they were themselves on the ground.

The Fruit Division was launched after a number of conferences. Mr. McKinnon, well known to some of you, was the first chief. He did a great deal towards the proper grading and packing of apples. The Fruit Marks Act was brought into existence. This was established as a necessary precaution, and simply requires that every sort of fruit that goes on the market shall be honestly and properly packed, and defines the kinds of packages.

I may say that this year when I came to Ottawa I went out to buy some strawberries. I went to a store and saw some fine ones. I bought a box and sent them home. When I got home I said to Mrs. Johnson: "I sent you up a good quart package of strawberries." She said "Quart box; you mean pint box." The top of the package was so arranged as to deceive the public. Every package must now be stamped.

Mr. McKinnon, as I say, was the first chief of the Fruit Division. He had a few inspectors scattered up and down the country, and they were constantly on the watch to see that the consumers were protected against unscrupulous packers.

I simply took up the work as established by Mr. McNeil, who passed away just about a year ago now. We have tried to develop the branch, and at the present time we have something like sixty inspectors. Up to the present time, it has been largely the object of the inspectors to see that the Fruit Marks Act is carried out.

We have inspectors up and down the Annapolis valley, instructing the farmers in the proper packing of fruit. Any man who does not take instructions, we fine if he does not pack his fruit properly. We are trying to do the work of inspection at the place of production rather than at outside points. If the fruit has not gone out properly packed it reflects discredit upon the district from which it has been shipped. If we catch it at the shipping point there will be a better grade go upon the markets than at present.

I took charge of this branch in May, and have not as yet declared any particular policy. The information which we are getting we hope to put into actual practice, and to be a decided help to the fruit-growing industry. We are keeping the large fruit growers informed as to the condition of the markets in Canada and foreign countries. We are endeavouring

to collect information as to the exact condition of things at particular points, and we inform the Associated Press to the best of our ability, of the same. The daily press is informed by the Associated Press on the wires, and it is published in fruit-growing districts.

We have been assured that these telegraphic reports have been of great value, because we have tried to give honest reports of prevailing conditions. Up to the present time the fruit growers have been advised largely by the brokers, and their intentions have not always been as honest as they should have been. For instance, in the results sent out from the Glasgow market, if that market happened to be very good, and a very high price made, that high price was telegraphed to all of the fruit-growing districts, which was very misleading to the farmers. We have endeavoured to overcome this, and have succeeded to a certain extent.

In the western provinces, in the centres such as Winnipeg and Regina, fruit is fairly plentiful, but when you get out into the small consuming centres, there is practically no fruit. This year, when I was down in the eastern provinces, it looked as if we had almost reached the limit of production, that is, the stage of over-production, in the peach industry. When I was down in the provinces of Nova Scotia and New Brunswick, however, I found that people were paying too much for their peaches. It was only here and there that even the wealthy man could obtain them. Even in Quebec I found that men would not touch peaches at all. It was only in a limited district around Niagara that the peaches could be obtained at all reasonably. I sent a man down to Georgia a few days ago to look into the conditions there, where they have everything systematically worked out.

This condition exists not only in peach growing, and we hope to increase the distribution of all kinds of fruit.

It has occurred to us that it is up to us to give demonstrations in marketing. The Government is producing, it is up to the Government also to give demonstrations in marketing. We hope to be able to place peaches and kindred fruits in Europe. We hope to place them in sections where they have never been placed before.

We have come to the conclusion that the people of Canada are not using nearly as much fruit as they should. In fact, on the street on which I live in Ottawa, I eat as much fruit as all the rest of the people put together. The reason is that fruit is too expensive by the time it gets to the consumer. Every middleman gets as big a slice out of it as the farmer has got, and the result is that it greatly reduces the amount of fruit consumed. I may say that although we recognize the producer, and are going to help him all we can, we recognize the consumer and are going to help him as much as we can; the middleman can look out for himself.

In the Prairie Provinces there is a big combine which controls the whole situation, and they say that the middlemen are growing immensely wealthy. But I am speaking of the wholesale man in our cities. I think that the wholesale men of Ottawa are not growing rich, nor are the retail men of Ottawa growing rich. If you go down to the market you will find 200 or 300 pedlars. They are not making themselves rich, but even from the small sales which they make every day, it shows us that the profits from fruit are enormous. Owing to the high cost it is not making the high prices which it should.

I remember just this season there were a number of carloads of apples bought at 25 cents a barrel on the trees. This was the price at which the grower had to turn them over to the wholesale man. By the time they reached the consumer they were worth from $2 to $3 per barrel.

The late Mr. McNeil preached from the Atlantic to the Pacific the gospel of co-operation. By co-operation we mean the uniting of fruit growers into a company, as it were, and we will advise them next season to place it (the fruit) right on the market and market it themselves, so that we will be marketing our fruit straight from the producer to the consumer.

Now, co-operation has made tremendous advances. Such a thing a few years ago was ridiculed, but it has been undertaken, and to-day we have from two to three hundred associations in Canada.

Just now a case entered my mind where co-operation has been of great value to people. A widow took care of her farm orchard under the instructions of bulletins, pamphlets, etc. as issued by the Department of Agriculture, and an apple buyer

came along and looked over her really beautiful crop, and told her that they would give her $125 for her crop. He said: "Unless you accept our terms in a couple of hours you will lose our offer and your apples will spoil." She telephoned me and asked what she should do. She asked me if the association would handle her fruit; and we said that although she was a long distance from the association we would do our best for her. We disposed of her crop, and at the end of the season she had some $1,250.

A result of the associations' work has been that this year the farmers from one district alone have shipped some 60,000 barrels; even in this year, and in the face of great difficulties and in the face of financial stringency, and the danger of the fight with the buyers, they obtained fairly good prices for the fruit which they produced.

Not only is co-operation a success in apples, but in plums, peaches, and pears.

I have nothing more to say to you, gentlemen, on this occasion. I am going down to Nova Scotia on the afternoon train, and what I have already mentioned are the chief results of our work. Dr. Hewitt is now going to address you. (Applause.)

(Mr. Grisdale rose and thanked Mr. Johnson on behalf of the audience present for his address, and was applauded.)

Dr. Hewitt: Mr. Grisdale and colleagues of the Department of Agriculture,—I think that those of us who have anything to do with Mr. Grisdale will agree that one of his characteristics is that he means what he says, and in writing to me to ask me here to-day the two chief points in his letter were: First, that I had to be very brief; second, not to say anything about what we are doing in the Entomological branch, but what we are trying to do.

I willl disobey him now that I am not under him, by saying that I will not tell you what we are trying to do, but what we are actually doing.

We are trying to prevent the introduction of insect pests into Canada even more than we are trying to control the pests already here, although, of course, we are trying to do the latter. As you know, we established, on different parts of the frontier, stations where all trees coming in from the United States are

fumigated. We now have in connection with those fumigation stations, inspection stations; because we find out that fumigation is not sufficient to destroy all the pests. We frequently stop very serious pests which would have come into the country had not the inspection service been in operation. In some instances, we allow the trees to come into the country and arrange for the inspection of the nursery stock on the premises of the owner. Last year we inspected some four million plants and trees coming into Canada.

As you know, we are a young country, and we import a large number of our trees and plants. We have to import these from countries where the pests are well established; they come into this country, and they do not bring with them the parasites which they had in their native country and thus they spread here uncontrolled and out of all proportion.

This, brings me to that part of our work which deals with certain pests which have come into this country through natural spread. The chief of these is the Brown-tail moth which is well spread throughout New Brunswick and Nova Scotia. To control this we are, by means of a force of inspectors, collecting the winter webs, which is the winter stage of these pests. We are collecting these nests all through the winter, when they can be seen on the trees.

We are doing this in conjunction with the Provincial Governments, who supply the same number of inspectors which we supply. These men, acting under the supervision of our officers, do a great deal of good. We have in New Brunswick a force of twenty-two inspectors, and in Nova Scotia a force of twelve inspectors collecting these pests, every year. We are also trying to approximate conditions which prevail in the country in which these insects are native; in other words, we are trying to approximate conditions in regard to control by parasites.

The United States Bureau of Entomology, Department of Agriculture, co-operates with us as much as any department of our own country. This department has spent some two or three million dollars importing parasites of the Gipsy moth and Brown-tail moth from Europe and Asia, and has established them in the New England States. These are now spreading, and are controlling the moths in the districts where they are abundant.

Dr. Howard is permitting us to make use of this work for which they have had such great expense, by allowing us to collect the winter nests of the moths. We find that the nests collected contain the parasites as well as the caterpillars. They give us accommodation in their laboratories, for our officers who breed out these parasites for us. They also collect *Calosoma* beetles which are one of the chief enemies of the Gipsy moth, and they are being reared at the laboratory at Boston from which they are shipped to Fredericton, where they are sent to the various points of distribution. In the last two years we have thus shipped some 60,000 of these parasites to different points, and in at least two places they have firmly established themselves.

Of course you can see that as we are gathering all these nests during the winter, we must not destroy them, because we should destroy the parasites contained therein. We therefore have to breed out the parasites from these nests, and last year we bred out thousands from winter nests which had been collected in Nova Scotia.

The control of the Brown-tail moth occupies a large amount of the attention of our men. We are gradually reaching our limit of controlling insects by means of sprays; I mean we can go so far and no farther: we cannot control insects in a forest or over a large area, and we either have to let things go or adopt natural means of control. We shall be in a better position to control insects by natural means when we have a greater amount of information to use. We can use this information in something the same way as weather prophets can tell you what the weather is going to be in certain parts of Canada on a certain date. For instance, if we know the parasitic history of insects, by having this knowledge we may be able to control the spread of these insects, for possibly we may be able to get these parasites and send them to a district where the pest is just getting started, and in this way control them. The study of these natural means will extend over a period of seven or eight years, and I hope that at the expiration of that time we shall be in a better position to determine the means of insect control over large areas. This work is taking place chiefly in the Maritime Provinces, but observations are also being made at all of our

stations. We have placed, in different parts of Canada, field laboratories or stations where definite problems are being studied. While the men are following certain definite lines of observation they are also making studies of many kinds of insects.

As Mr. Johnson was telling you, our work is largely concerned with production, for while we do not tell people directly how to produce, we do tell them how to prevent loss which will decrease production. You can see in what way our work is directly concerned with production; the means which are taken to control insect pests may increase production. The use of insect remedies actually does in some directly cases increase production.

Our work covers various sections, and it may be most convenient if I briefly run over these and tell you what we are doing in each.

I presume that most of you are interested in the insects which destroy field and forage crops. In the West, Mr. Norman Criddle has been studying the Hessian fly, the Wheat Stem maggot and the Wheat Stem Saw fly. I might say that we are doing some work in co-operation with the United States Department of Agriculture: he are carrying out an investigation of the white grubs, and are doing this over large areas. We are not observing any international boundaries in these investigations. In western Ontario we have a laboratory near London, and in Manitoba we have another station. These investigations have shown us two very interesting things. In Canada, up to a few years ago, we were compelled largely to use the results of investigations in the United States. Well, to a certain extent they were all right, but we find now that we are investigating these pests under our own conditions, that many of these methods are not strictly accurate.

Take the white grub in Manitoba; one of the chief methods advocated is deep ploughing. We now find that deep ploughing is no good at all, as the grubs go so deep. You can thus see that the methods of controlling advocated in one place may not be applicable in another and that we must make independent observations of our own instead of relying upon other countries' investigations.

What is required to-day, more than anything else, is a rigid study and a very intensive study of many of our very

common insect pests, concerning which our previous knowledge was very meagre and in many cases inaccurate.

In southern Alberta, Mr. Strickland has been carrying on observations, and we are also conducting investigations in eastern Canada.

We are also carrying on investigations with regard to locusts. In one district near Three Rivers, Que., the farmers are leaving because of the immense quantities of grasshoppers. We are studying remedies used in Kansas, applying the knowledge gained here, and it has proved to be very effectual. We have also been trying out a method of controlling grasshoppers by a bacillus, which has been said to be very useful in Argentina.

Coming now to fruit insects: we are carrying on a number of investigations on fruit insects in the Maritime Provinces, especially Nova Scotia. Mr. Sanders has been working on the Bud moth, the fruit worms, and the Codling moth, and he has found a satisfactory spray which will control these three insects together. Mr. Sanders has been preaching his gospel of spraying down in Nova Scotia, and I think that Professor Blair will agree with me that no one man has done more to increase spraying in Nova Scotia than has Mr. Sanders. In fact, the increase in Nova Scotia of spraying is really phenomenal, and it is a source of pride to us who are endeavouring to help the fruit growers in that province who suffer from insect pests.

In a laboratory in Ontario, Mr. Ross is carrying on experiments on the control of the Apple maggot or Railroad worm, and we think that we have a method that can be used to successfully control that pest. The aphids Mr. Ross has been working on very completely, and he has made during the past year an important discovery which may put into our hands the means to control one of these aphids. The "Rosy Apple aphid" is one of the worst aphids in that section. During the last year, Mr. Ross has been able to find that the alternate host of the Rosy apple aphid is the common plantain which is so familiar to all of us, and which grows as a weed in almost every orchard. This discovery will enable us to go ahead with the methods of control.

I must now briefly turn to the work which we have been doing in forest insect investigation. Until last year almost noth-

ing had been done to control or investigate the forest insects, when Mr. Swaine established his laboratory on the Pacific coast. It is in British Columbia that we have the greatest amount of valuable timber in Canada. The timber in Eastern Canada is small in value compared to the value of the timber in British Columbia. The investigations conducted by Mr. Swaine have disclosed an enormous destruction of timber in that province. In the Okanagan Valley he discovered a region almost entirely denuded of living trees by bark beetles; a casual observer would say that thishad been done by forest fires.

We have been enabled to devise operations which would combat these insects successfully, and if the lumbermen will avail themselves of this, it will certainly pay them.

We carry out quite a little work on insects affecting the health of men, and insects affecting the health of animals. We are now prosecuting experiments on the various parasites, such as the Warble fly and other flies affecting domestic stock, and it is in matters such as these that we should like to have co-operation with the Superintendents of the Experimental Farm system in so far as they can put us in touch with men combating these pests.

We have found that superheating, which has not been employed in this country in the past, gives us a very satisfactory method of dealing with those insects, such as the Mediterranean Flower moth, affecting stored products and mills, etc.

In this way you will see that there is hardly a walk of life with which we do not come into contact.

We shall take up the study of our native mosquitoes, which I have not yet had the opportunity to do, but which will come in time.

Our work is largely of an investigatory character: we study these things and give the people the results of our work. My idea has been that we should largely confine ourselves to actual investigation, as we have the trained men who are capable of carrying it on and, having found out methods of con trol, hand over these to the provincial people and have them carry out the work accordingly. I might say that there are places where we are carrying on work with the Provincial Governments, and on all hands are receiving great assistance.

Before sitting down—having occupied the time allotted to me—I should like to ask the Superintendents, with most whom I am acquainted, not to forget, in spite of our growth and our separation from the Experimental Farms, that they can do us a great deal of service by putting us in touch with men who have problems which they think we can solve.

Formerly, before we had any representatives or any stations out, a man might not send specimens of the insect, but expected us, by some peculiar working of the mind, to tell him a cure. In some cases we might, when they did not send us a specimen of the insect, diagnose it wrongly. We are now better enabled to advise those men who write to us.

During the Army-worm outbreak in Ontario, we saved farmers many thousands of dollars; the amount we were able to save was quite incalculable. Our officer who was working down in the section where the outbreak occurred happened to know the exact methods necessary. Other methods are simply a waste of time and labour. That showed to us very markedly the practical value to the farmer of our present methods, and I hope that the Superintendents will enable us to extend our work along those lines, and will keep in constant touch with us, and tell us of farmers who wish for information on insects which might cause possible outbreaks.

(Mr. Grisdale rose and thanked Dr. Hewitt, and was vigorously applauded.)

Mr. CHITTICK: We have, I am sure, listened with pleasure to the very interesting remarks made by Mr. Johnson and Dr. Hewitt.

I am afraid that, as my correspondence with the Superintendents of the branch Farms and Stations is mainly confined to criticisms of their handling of financial matters, they may not regard me with quite such kindly feelings as they do our other officers. In fact, some of their replies to my letters quite confirm me in this opinion. If my criticisms are brief and to the point, their replies, I can assure them, are equally so. I remember receiving a letter from one of the Superintendents which was so strenuously expressed that I said to Mr. Grisdale: "Why buy dynamite when you have such a high explosive on the Farms system?"

However, I do not take to heart these little exchanges, nor should the Superintendents. There is no hard feeling on my side and, I trust, none on theirs. Doubtless the accountant's office seems to be unduly particular sometimes over an apparently small matter, but we are governed by fixed rules and regulations, and all our accounts and returns are submitted to close scrutiny in every detail, by the Audit Office. Naturally, it is our aim so to present everything from the Department of Agriculture that no criticism can be offered, or question raised.

I am always pleased to give you any information I can as to the payment of accounts or the total amount expended up to a certain date at the Farm or Station under your charge. You can assist greatly in this by trying to get all your accounts and returns sent in as soon after the close of the month as possible. This will also help greatly in estimating the financial requirements of the Farms system.

I do not know that I have anything else to take up with you. I am very pleased to have had the opportunity of meeting you, and hope to have it more frequently in the future. (Applause.)

PART III.

SPECIAL ARTICLES

(In Elaboration of some of the Subjects discussed at the regular Sessions.)

OUR PUBLICATIONS.

By J. H. Grisdale, B. Agr.

During the past two or three years, the trend of the Farms' policy has been toward the more frequent publication of the results of our work, in the form of summary reports, bulletins, and circulars. Our annual report, moreover, is growing apace, involving in its preparation more and more detailed work along a greater variety of lines than heretofore.

There is a danger that, in this increase of quantity, the standard of quality may be somewhat lowered and the following is written with a desire to bring about a feeling both of partnership and of friendly emulation among our officers in the preparation of material for the press. It is not to impose a greater burden upon any that I urge the need of a high literary standard, but because of an anxiety, which I wish all to share, to make our Experimental Farm publications, from annual report to circular and leaflet, models for other agricultural institutions to copy.

It should never be forgotten that the Experimental Farms are conducted, and that we are officers thereof, for the sole purpose of helping the farmers of Canada. Our work to this end falls naturally into two great divisions: first, the accumulation of data by careful experiment; and, second, the making of our results known.

Now, our experimental work may be excellently planned and faultlessly carried out, but unless the information obtained therefrom is imparted to the farmers of this country in a timely, clear, full, and forceful way, our purpose is frustrated.

A few of our farmers hear us give addresses; a few more visit the Farms; others we are in touch with through correspondence; but it is upon our publications that we must depend in the endeavour to reach the vast majority of those engaged in agricultural pursuits.

Material for the press, then, which is unsatisfactory in whole or in part, hastily prepared at the eleventh hour, inaccurate

or incomplete, poorly arranged or obscurely expressed, means simply this: that, in so far as it falls short of our very best effort, just so far have we failed to do our duty as officers of the Experimental Farms.

It is proposed herein to take up, in a general way, a few of the main points to be kept in mind in the preparation of material for the press. These features, added to many others which will suggest themselves to each of us, will constitute the framework of our "Experimental Farms standard."

STYLE.

We are trying to reach, interest, and instruct our farmers—as conservative, practical and busy a class as can be found. Remembering this, ornate language and highly-polished periods become of secondary importance, and the style to be sought after and cultivated is the one based on three elements: Clearness, Simplicity, Conciseness.

Clearness.

By this term is meant the opposite of what is vague, ambiguous, or obscure. Plans, operations, results, and deductions should be plainly described, so that there remains no doubt as to the writer's meaning. Nothing can be read with interest when constant effort is required to glimpse the thought through the muddy medium of obscure language.

Clearness of expression must be preceded by clearness of thinking and a thorough grasp of the subject treated. Let us fix in our minds exactly what we desire to say. It is then a comparatively simple matter to find words to make the thought clear to others.

Simplicity.

It is perhaps always true, and is certainly the case with publications such as we are here discussing, that the best style is the simplest, made up of the most easily-understood words and expressions which will convey our meaning, and constructed in the most readily-followed way. A scientist, reading a paper before a scientific society, may perhaps be pardoned for falling

into that technical jargon with which his hearers are presumed to be familiar. Our audience, however, is made up of diverse elements. It is composed of the workers in the basic industry of the world, men of all degrees of intelligence and education, and we should endeavour so to express ourselves as to be understood by all.

Once more it holds true that the better a writer understands what he wishes to say, the easier is it for him to express himself in plain Anglo-Saxon.

Conciseness.

If clearness and simplicity of style be kept in mind, conciseness naturally follows. Nothing can be clearly or simply expressed which is full of repetitions, circumlocutions and phrases which add nothing to the meaning. The reader's mind is confused by the effort to separate what is really significant from its useless trappings, and the conclusion he generally arrives at is: either the subject is of small importance, requiring verbal padding to give it an appearance, or the writer knows little of what he writes about and so keeps threshing out old straw through ignorance of other features of his topic.

Say what you know clearly and simply, omitting no detail which will enable the reader to grasp your meaning and get a just view of the question. When you have done this, stop!

On the other hand, the endeavour to write clearly, simply, and concisely should not lead us to neglect the embodying of our ideas in well-constructed sentences and pleasing language. Simplicity does not mean carelessness, colloquialism, or the use of slang. Frequent repetitions of a word, awkward combinations of words and sentences, inexact use of words, neglect of punctuation, grammatical errors, false brevity obtained by the omission of the article, sentences either miserably constructed or not sentences at all, distract the attention from the thought to the rags in which it is clothed.

There is no surer way to lower a writer in his reader's opinion than his failing to express himself in a correct and agreeable manner.

ACCURACY.

Our publications are intended to inform, not to mislead; to serve as works of reference. Accuracy, therefore, to the smallest detail, is of prime importance. The *exact* word, the *exact* expression, the *exact* shade of qualification required to give a true statement of the case should be the aim, which we as yet fall far short of. Even errors of calculation and addition are numerous, although a very moderate degree of care in preparing our manuscripts should eliminate them. Errors in names of varieties frequently occur, although a reference to previous reports should solve most such difficulties.

Everything should be weighed, balanced, and verified to the last degree before being presented to the public under the writer's name.

FULL AND BALANCED TREATMENT.

It is natural and commendable that each of us should be especially interested in some particular line of our work. Our aptitudes and training have led us in this direction. This special interest shown by its officers is a valuable asset to the Experimental Farms, and nothing is here said to restrict its full development and use. It is only its *abuse* that we should guard against—that is, when we are led thereby to neglect other lines of our experimental work.

The result of this lack of balance is seen in the material for our annual reports. One feature of the work is dealt with fully; is written in an interesting manner, and shows the painstaking and enthusiastic investigator in every line Another feature is reported on, it is true; but we have merely the skeleton of the work done, the dry tables of results, without statement of plan, comment, or deduction.

We should try to deal with each line of experiment fully and fairly, bringing it into its proper proportions in the whole scheme of investigational work we are carrying on.

UNIFORMITY OF ARRANGEMENT.

We are now bringing out our annual report in a new form, the material being grouped according to subjects. The best way of presenting the information under each subject-head has

been given much careful thought, and while, doubtless, there is yet room for improvement in detail, the main lines of the new plan seem fairly settled.

Although it is not expected or desired that any officer should sink his own individuality and write his reports in a set, mechanical way, the chief features of the arrangement of our reports should be as uniform as possible throughout. For instance, nothing is gained by arranging the items in the reports on Field Husbandry, Animal Husbandry, Cereals, Horticulture, or Forage Plants in one order this year and in another order next year, or in having them reported on in one order from one Farm and in a different order from another. The sequence of subjects and the arrangement of headings and sub-headings should be the same at all Farms in all years. The same remark applies to tables. Variations here are confusing when comparisons are being made. A standard form should be adhered to.

This will give a much more finished appearance to our report and, vastly more important, it will impress upon the reader that the Experimental Farms constitute a system, with a mutual understanding among its officers and with a well-defined plan of reporting on experimental work.

ILLUSTRATIONS.

Illustrations are used for the purpose of doing what the word implies—throwing more light upon something, making it more clear. A good photograph or drawing for reproduction is often worth more than a page of text. A fine view of lawns, trees, and shrubbery is a greater incentive than any amount of description. But a photograph poorly taken, or without point, is worse than useless.

The subject of illustrations should be kept in mind throughout the year, and an effort made to get good photographs of some of the features of the work soon to be reported on in print.

TIMELY PREPARATION.

We have doubtless read of some famous author dashing off a masterpiece in a few sittings. Most of us (I say "most" so that anyone may regard himself as the exception if his con-

science will permit) attempt the same thing when preparing press material, but fail to hand in a manuscript doing us the credit it should, for two reasons: First, we are not "famous authors"; and, second, agricultural reports and bulletins of value are not the result of inspiration, but of patient, accurate marshalling of facts and deductions.

We all have many and insistent calls upon our time and attention; the temptation to put our writing off "to a more convenient season" is a strong one. But the time comes when it *must* be done, and every year some of our officers make the vow to me that never again will they put off writing their report or bulletin until the last moment, when outside work is keeping them busy all day.

The necessity for the early preparation and forwarding of manuscript is felt in an especial manner in connection with our yearly bulletins giving summaries of results obtained the previous season. The only object in issuing these is to get into the farmer's hands the main results of our work for the year in time for him to profit by them the coming season. If we are too late in issuing these summaries, if spring work has started, the bulletins are useless and the material might as well be held for the annual report. Now, the setting-up, proof-reading, printing, and distribution of these bulletins take time. Delay in sending in the manuscript jeopardizes the value of what would otherwise be most useful publications.

I hope that we will all turn over a new leaf in this matter. It will, I am sure, help to make the preparation of our manuscripts a pleasure, to commence them with plenty of time before us. It will enhance their accuracy and finish, for we can review, add to, and modify at our leisure, and when finally the publication is issued with the writer's name upon it as vouching for its accuracy and careful preparation, there will be few things therein which he will regret not having verified or expressed differently.

You are being handed herewith a copy of "Suggestions on the Preparation of Copy for the Printer" which has been compiled by Mr. J. C. Shipman, Copy Editor at the Government Printing Bureau, from notes which he has taken day by day, while editing material sent in for print by the various departments.

As the author states, he does not issue it as complete or final, and welcomes suggested additions. It is full of detailed information which will aid us materially in sending in well-prepared manuscripts.

I would strongly urge the careful study of this publication, and its preservation for reference, as it is proposed to follow closely the rulings and suggestions contained therein. I venture to add to its very practical contents, a few "Dont's" for our especial benefit:—

(1) Do not send in your manuscript written on your letter head or on manifolding paper. Use a good quality of unruled foolscap.

(2) Do not send in a carbon copy. Send the original.

(3) Do not use the personal pronoun "I" when it can possibly be avoided. Nothing looks worse in print than a frequent repetition of "I did this," "I did that." It is better to use the plural "we," but by all odds best to employ the third person"the Superintendent," "the Director," etc.

(4) Do not make impolitic references or recommendations in your press material. If you consider your work has been hampered through lack of certain facilities, or if you wish to recommend a certain line of action, your views should be expressed in a memorandum addressed to the Director, not put into your annual report for distribution to the public.

CROPS IN RELATION TO WEATHER.

By R. Mills, B.S.A.

By the co-operation of the Dominion Experimental Farms system with the Dominion Meteorological Service, it is hoped to advance the science of Agricultural Meteorology during 1915.

The present impetus to learn more about crops in relation to weather comes officially from the International Institute of Agriculture. Under its authority a careful investigation was made, with the object of learning what each important country in the world was doing, directly through its Weather Bureau, for agriculture. An elaborate report was presented

to the Institute in 1913, and the direct result was the creation of a permanent international commission on Agricultural Meteorology. Mr. R. F. Stupart, Director of the Dominion Meterological Service, and Dr. F. T. Shutt, Dominion Chemist, are members of this commission, which was only prevented from holding its first meeting in Paris, during the summer of 1914, by the great European war. The report, referred to above, was to have been acted upon at this meeting, and a uniform plan prepared, so that all countries might co-operate to increase the world's knowledge on these matters. The Institute desired, through the commission, to stimulate in every country a study of field crops in their relation to weather conditions, with the practical object of increasing yields and lessening losses.

In February, 1914, a graduate of the Ontario Agricultural College was appointed to undertake research work in Agricultural Meteorology for Canada. The work of other countries was investigated, in order to find out the present state of the world's knowledge of this science. It was found that a number of experts are at work on the broad questions of plant distribution, and that some skilful efforts have been made, by mathematical methods, to find the effect of average precipitation and temperature on final yields. It was found, too, that a good deal had been learned about certain harmful weather factors, such as frosts (especially in its effects on fruit trees, etc.), and that something had been accomplished in lessening the damage. Canadian weather records and crop statistics were used in preliminary studies, and the need of careful crop notes became increasingly apparent, in order that the detailed weather records might be compared and correlated with them.

It was found that Russia has for over fifteen years carried out field experiments in Agricultural Meteorology and saved a good deal of money as a result of the accumulated knowledge. At more than 100 experiment stations in Russia, meteorological instruments are set up very close to field plots of grains and other crops. Notes are carefully kept of the growth of the plants, of the dates of special plant activity, such as heading, etc., of the condition of the crop on these dates, and of the effect of damaging weather factors on crop and on soil. Weather records are accurately kept, and thus the crops and the weather

are closely studied together. Every effort is made to get at the *facts*, and as these have been acquired, remedies to avert losses have naturally been discovered and applied with good financial results.

Can bad harvests in unfavourable seasons ever be averted? The answer comes from Russia that they can be improved at least. And the method of studying the facts in the field, then searching for practical remedies, looks to be the most scientific and promising way known at present.

Although the International Commission on Agricultural Meteorology cannot be applied to for guidance just now, some advance in the science can surely be made in Canada during 1915. And the Dominion Experimental Farm system can assist. Records of temperature, precipitation, and sunshine are kept at the Farms, and at each are men of agricultural experience. Printed forms have been prepared on which the observer may record the progress and condition of plots of Marquis spring wheat throughout its season. These forms are modelled on the Russian, and are in line with the most up-to-date progressive methods. No outlay of additional money will be required to carry out this study on wheat and weather during 1915. The scheme of the work can be improved and added to as years pass and, should the results justify the expense, the study can be extended to all important crops, and the equipment of meteorological instruments increased. The field notes and the weather records will be carefully analysed and compared for each Farm, at the Meteorological Office in Toronto. The plan for 1915 constitutes a beginning and an advance, in keeping with the modern spirit of progress and investigation.

FERTILIZER EXPERIMENTS ON THE DOMINION EXPERIMENTAL FARMS.

By A. T. Stuart, B.A.

I.—The Importance of the Study of Fertilizers.

The history of soil fertilization, in the modern sense of the word, does not date back very many years. In the United States, forty years ago saw only the initiation of the practice on any considerable scale; in Europe we cannot date it back more than as many years before. To-day it is stated that the farmers of the United States spend in the neighbourhood of $120,000,000 per year for fertilizers; while, areas considered, some countries of Europe use a very great deal more than this. The sum total of the world's fertilizer business can, then, only be measured in terms of hundreds of millions of dollars per annum, and this was evolved from practically nothing in the last fifty years. No better proof than this as to the efficacy of fertilization need be made.

To deny off-hand that fertilizers can be made to pay must indicate, in the face of evidence, a lack of proper experience. Such a claim, heard in some quarters, might be but a confession of ignorance of how to make them pay. The fact that an occasional plot will show a very large profit, and several others show losses does not brand the practice as a "hit-or-miss gamble." The mere fact that sometimes very large profits are shown indicates the possibilities and the need for careful investigation.

The fertilizer business in Canada to-day does not total much more than $1,000,000 per year. In these lines we are relatively in the position of the United States twenty-five years ago and of Europe fifty years ago, and it is safe to say that another twenty years will see the same rapid development in Canada. Whatever profit can be attributed to the use of fertilizers is very much more real than apparent, for usually it is obtained at little cost other than that of the material. Although at first the profit may appear to be only in proportion to the increased yield, when all costs are deducted it may mean that the net returns of the farmer are increased very greatly, or even several-fold.

II.—Review of Literature.

A more or less complete review of the literature on fertilizer experiments has been made, and it has been attempted, as far as possible, to benefit from this recorded experience in planning the work. It is to be noted that twenty years ago saw large numbers of fertilizer experiments conducted throughout the United States. The number has rapidly diminished until to-day comparatively few are being carried on. This is significant. The Bureau of Soils at Washington has reviewed some 20,000 experiments, and has made the following generalizations, which are confirmed in our own experience:—

1. It is generally more profitable to use complete fertilizers.

2. No advantage is seen in very large applications.

3. Fertilizers seem to show effects on all types of soil, even on those considered rich.

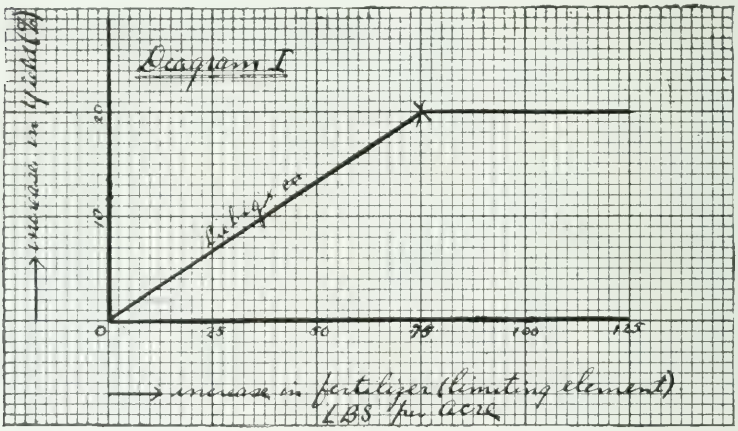
III.—Discussion of Plans.

A fertilizer experiment is but a means devised to measure or compare values, and yet amongst all the voluminous literature we find little discussion on plans adopted. Lately, however, some criticism has appeared on the methods in use at many places, and it is often possible to predict failures in the attempt to prove that for which the experiment was designed. The ideal condition is to eliminate all variables other than the one to be tested out, but, aside from pot work in greenhouses, this is impossible and, in field work, we must resort to averages.

In experimenting it is well to restrict attention to the regular farm practices so that the results will have a more practical bearing on such cases as are found in the various rotations to be met with on dairy and stock farms, hay and pasture lands, grain, orchards, etc. For the work in hand at present, it is proposed at first to restrict its scope greatly in order to benefit by experience as it progresses. The plan is to study briefly one of our commonest rotations, and to endeavour to find how best it might be treated. Take for example, the rotation roots (potatoes), first year; grain seeded down with timothy and clover, second year; and hay, third year.

IV.—The Law of Minimum.

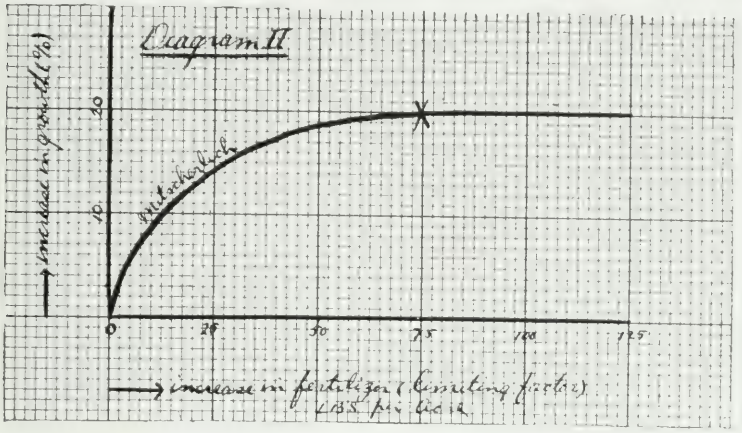
It is felt that in many of the experiments recorded in the literature on the subject, little or no regard has been had to the law of minimum as studied by Liebig and Mitscherlich. It is only reasonable to suppose that in comparing the virtues of several "complete" mixtures of fertilizers, when these are applied largely in excess of what is required, the resulting increase in growth should be approximately the same. But it is not right to assume that the cheapest one is the most efficient. If fertilizers effect an increase in growth we must recognize a limit to this effect, otherwise we could continue to infinity. It is said that *a fertilizer is applied in minimum only when the smallest amount is used which is necessary to produce the largest increase in growth. All comparisons should be made in minimum.*



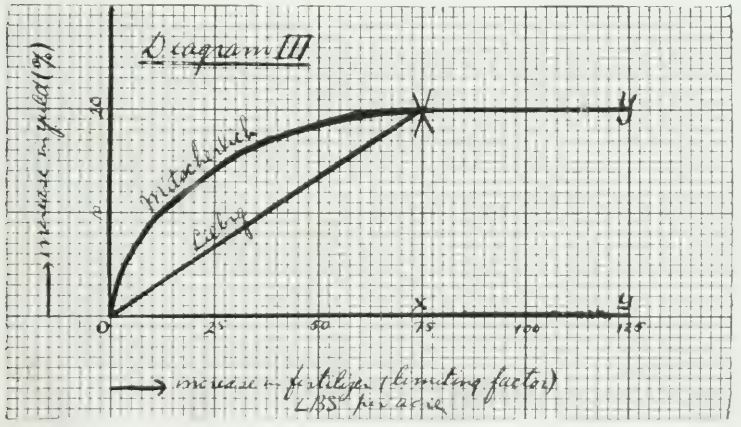
According to Liebig, this increase is proportional, directly, to the amount of the application of the element in minimum until the limit is reached. This is represented by the diagram No. 1. Thus the line representing the influence of the fertilizer is a straight line until it reaches the point X, when no further increase can be produced no matter how much is applied.

Mitscherlich has modified the diagram and, according to his conception of the "law of minimum," the "increase in plant growth with unit increase of the element in minimum is proportional to the decrement from the maximum." This is shown on diagram II. This indicates that the first slight

application of fertilizer causes the greatest effect. Further applications show lesser and lesser effects until the maximum (point X) is reached, beyond which no increase is shown. Of



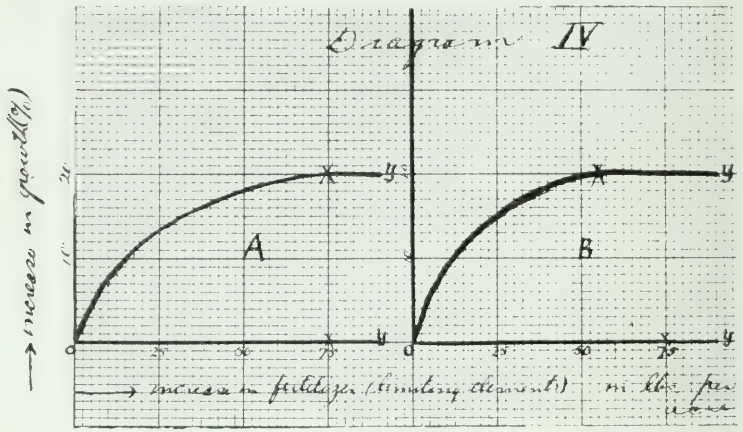
course this point X is coincident in both diagrams, and therefore the lines can be plotted together as in III.



V.—Application of the Law of Minimum.

It is now evident that, if we wish to compare the effectiveness of fertilizers, singly or mixed, we must discover the minimum in each case before drawing conclusions. This point is to be found by making applications in several amounts and,

judging by results, we find the minimum. For each material or mixture we can plot a curve according to Mitscherlich (diagram IV).



In the illustration it is evident that C represents the most effective fertilizer because the least amount is required. But suppose, as is ordinarily done, each material had been applied in excess—Y pounds per acre. The growth in each case would

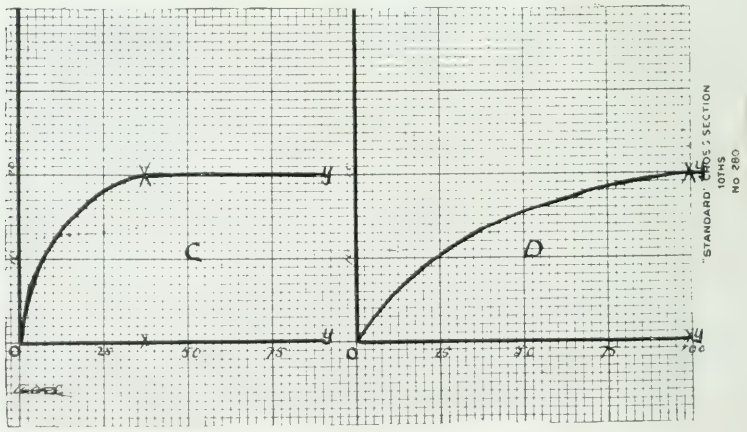


Diagram IV.

be represented by Y on the curve (20 per cent) or roughly the same in each case. The conclusion would be that each fertilizer is equally effective, whereas C is twice as effective as A.

It is surprising to find that large numbers of experiments, though carefully conducted, have led to conflicting and plainly erroneous conclusions.

VI. Systematic Plan for Fertilizer Experiments.

In the following scheme, various mixtures are applied, each in several amounts, and the minimum requirements are obtained. Only at this point can definite conclusions be drawn. It would be more correct first to determine the correct forms of N, P, and K to use, or mixtures of several forms, before determining the correct formula. It is also to be noted that the amounts of N, P, and K alone are used for the reason that the ordinary factors N, P_2O_5 and K_2O would not permit of symmetry in the diagram.

All possible combinations of three things can be represented

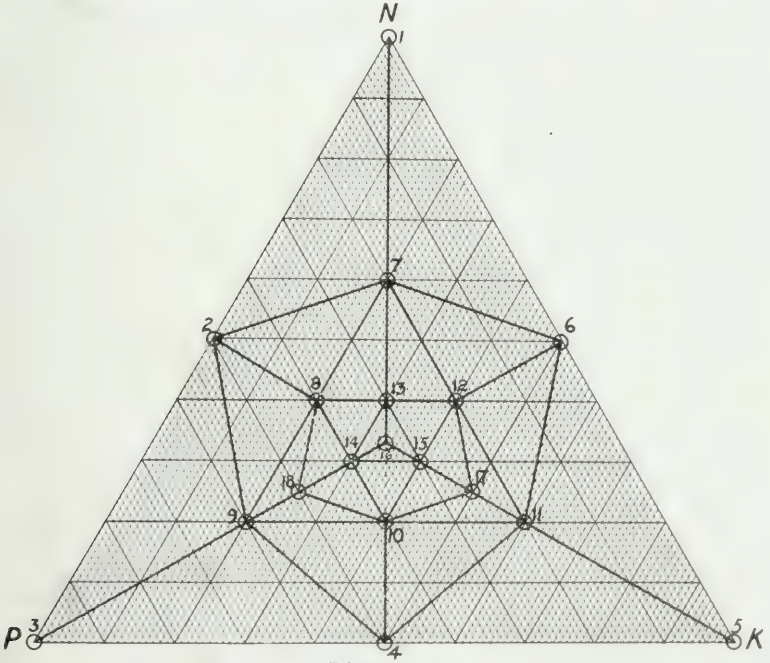


Diagram V.

on a plane three-dimension diagram. Each corner will represent a single element, the sides combinations of any two in all possible proportions and the area in the centre possible

combinations of three elements. *Every fertilizer formula or single substance or mixture can be represented by a point in the diagram.* (diagram V).

By starting with the figure, we can study fertilizers systematically and not overlook anything in the way of formulae. The area can be divided up strategically, and every crevice and corner explored. Having chosen the points of formulae, we can, by joining the points by lines, divide up the area into triangles. Each point is now tested and the maximum possibilities for profit found by having regard to the law of minimum. The profits obtained are entered on a chart, and hence we can locate the proper formula. This may be at one of the points or within a certain triangle.

The variables of season, climate, soil, etc., can only be overcome by averaging repeated experiments in various localities. For a start, it is proposed to apply the scheme at five points in Canada, and to a rotation of potatoes, grain and clover, and hay. Results are to be noted throughout the rotation, and due regard had to the effects.

A few other plots are added to round out the experiment. Point 17 is chosen, representing the formula 4–8–10, and it is tried in combination with manure and with subsequent treatments in the second and third years. In addition, then, to the above we have:—

Manure alone at the rate of 15 tons per acre on root crop.
Manure alone at the rate of $7\frac{1}{2}$ tons per acre on root crop.
Manure, 15 tons + fertilizer XVIIB + nothing in second and third years.
Manure, 15 tons + fertilizer XVIIB + 175 pounds of XVIIB in second and third years.
Manure, $7\frac{1}{2}$ tons + fertilizer XVIIB + nothing in second and third years.
Manure, $7\frac{1}{2}$ tons + fertilizer XVIIB + 175 pounds of XVIIB in second and third years.
Also some check plots.

It is felt that certain general deductions can be made which will apply in all cases of fertilization of this rotation, while other deductions may apply only to the particular locality, climate, or season. It seems probable that a proper method for the treatment of each crop in the rotation can be worked

out, rather than the usual practice of fertilizing but one crop in excess and relying on the residues to benefit other crops. In this way costs would be properly proportioned and charged up against each crop.

VII.—Points illustrated by the Diagram.

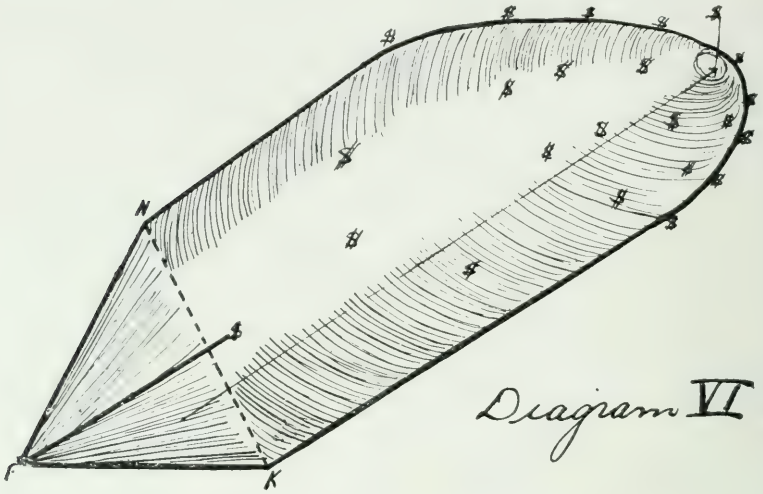
The plan of procedure is of very general application, and can be used in attacking many of the problems of fertilization. It is very interesting to study the diagram and locate on it many of the commercial brands of fertilizers. It is found that by far the greater number are located inside the triangle formed by the points 8, 9, and 10. The only reason for this that is apparent off-hand is the fact that they are farthest removed from the N and K corners—the most expensive—and are closer to the P corner—the cheapest. Most commercial fertilizers are richer in P than in N or K, and yet the products of agriculture and manure (which, in its content of N, K, and P, must of necessity closely represent them) correspond roughly to the formula 2 1 2 (point 12 on the opposite side of the diagram from commercial fertilizers).

Again, we commonly find people making applications of N, P, and K alone, represented at the extreme corners, and of mixtures of any two, represented by various points on any of the sides of the triangle. It is hardly right, therefore, to explore the diagram in certain sections, to the neglect of others.

It is realized that the first trials will hardly measure up to the possibilities, but it is hoped that valuable experience will be gained by means of which improvements can be made. On such crops as potatoes, too, it is felt that the usual profits obtained are so far removed from the cost of the fertilizer that it will be hard to differentiate which complete fertilizer should be used. This point could be located, in fact of necessity would have to be, with greater nicety on crops where the money values are much less per acre than in the case of potatoes.

For a simple method of getting results we need merely to enter on the chart the highest dollar ($) value possible for each point, and locate very closely the largest profit. Or we might erect a perpendicular on each point to represent dollars and,

by joining up the ends of the perpendiculars by a surface, like a roof, we get a cone. By a little work we can estimate the position of the apex of the cone, and this will tell us the correct fertilizer to use, and how well it would pay (diagram VI).



VIII.—How the Plan may be Further Enlarged Upon.

Interesting points could be considered if it were possible to control absolutely all variables. Obviously, this is impossible, but pot-work in the greenhouse, with some plants, would afford interesting data. In the greenhouse we could collect several types of soil—say, from five widely separated points in Canada. Each sample would be thoroughly mixed, and five series of experiments conducted. The variables under control in the greenhouse would include soil, temperature, light, heat, water supply, evaporation, drainage, aeration, mechanical condition of soil, etc. In short, all variables could be controlled at will, and the number of pots extended almost without limit.

Under such conditions, much of the preliminary work could be covered, and the work of completion narrowed down considerably. The experimentation could then be transferred to the fields for completion. Were such data collected we could largely extend the use of the four-dimension diagram.

The plane three-dimension diagram represents all possible mixtures of N, P, and K. The fourth dimension, at right angles to this plane, can be added to represent the total amounts of elements added. The result is a solid diagram, a prism, of four dimensions. On it can be charted all possible amounts and proportions (diagram VII).

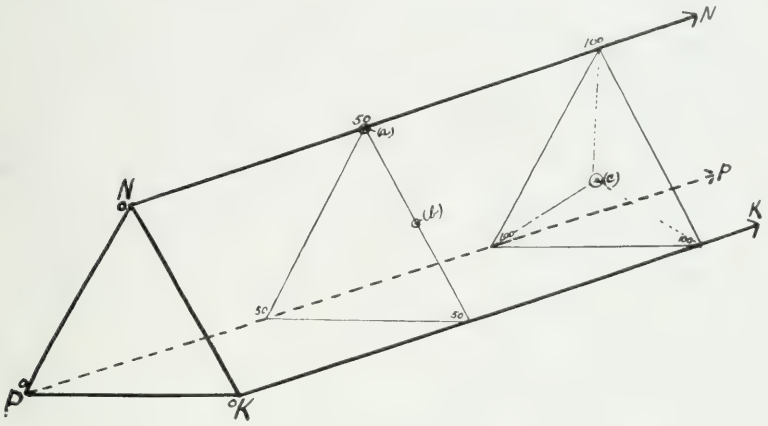


Diagram VII.

Every point in or on the prism—on an edge, on a face, or internal—has a definite meaning. The point (*a*) part way up the N edge, means a fertilizer containing only N, and applied at the rate of 50 pounds per acre of N (333 pounds $NaNO_3$). The point (*b*), in the centre of the NK side, part way up, represents a fertilizer containing equal amounts of N and K and applied at the rate of 50 pounds per acre (25 pounds N and 25 pounds K, such as 166 pounds $NaNO_3$ and 62.5 pounds KCL). The point (*c*), right in the centre of the prism, part way up, represents a fertilizer containing equal amounts of N, P, and K, and applied at the rate of 100 pounds per acre (33.3 pounds N, 33.3 pounds P, and 33.3 pounds K, such as 222 pounds $NaNO_3$, plus 476 pounds acid phosphate, plus 83 pounds KC1).

By experiment we now find the "minimum" for each fertilizer. This reads in pounds per acre and, by a little calculation, it is entered on the figure or, more easily we erect a perpendicular wire up from the triangular plane. These wires

would, of course, be of unequal lengths, the shortest ones representing the most effective fertilizers and the longest the poorest. The figures would be somewhat like diagram VIII, the shortest wires being central. If we now join up the tips of all the wires by a surface we get an inverted cone inside the prism. The tip of this cone is the answer (diagram IX).

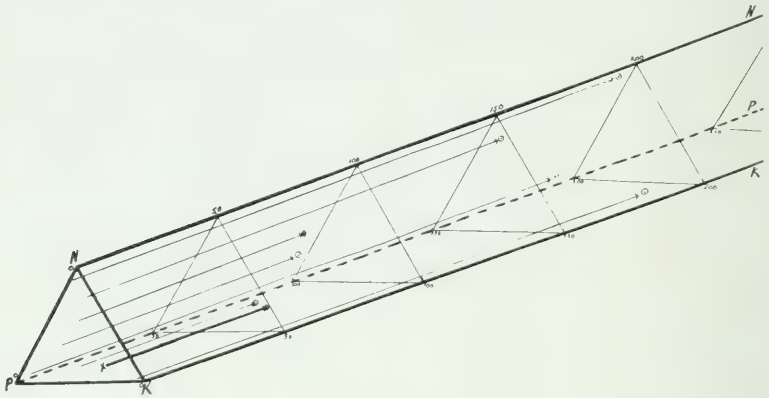
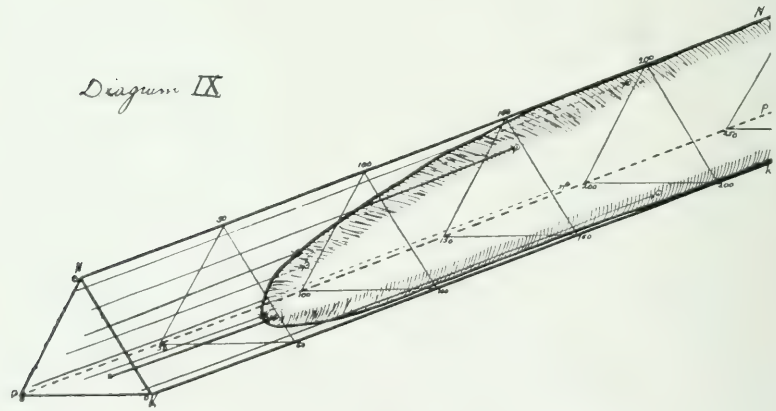


Diagram VIII.



Having sufficient points observed and entered on the chart we can locate the general layout of the conical surface and, by interpolation, fairly accurately discover the position of the tip. From this we read off the result—the correct formula and the correct amount.

X. Experiment to Compare Different Forms of Elements.

A further experiment has been added to test relative qualities of materials. For this, the element to be tested is tried in various proportions, the other elements always being present in excess of requirements.

We can thus compare the smallest amounts of $NaNO_3$ required with the smallest amounts of $(NH_4)_2SO_4$, both as to weights and costs of the N content; similarly, the efficiencies of acid phosphate, basic slag, and bone. All this could be also charted as above.

Explanations and Directions.

(Followed in preparing fertilizers for the experiments described.)

Note.—*All these have been mixed and sacked at the Central Farm and will be delivered ready for application.*

Experiment "A".—To find the most effective formula for fertilizer.

(50 plots to be numbered as in table II.)

1. The purpose of this experiment is to try out each of the fertilizers represented by the eighteen points on diagram V. Points I to VI are applied at but one rate per acre, while VII to XVIII are applied at three different rates. Thus, in experiment "A." with the plots A to H, we have a total of 50 plots.

2. *All mixtures are made as follows:—*

One-half nitrogen applied as nitrate of soda ($NaNO_3$—15 per cent nitrogen).

One-half nitrogen applied as sulphate of ammonia ($(NH_4)_2SO_4$—20 per cent nitrogen).

One-half phosphorus applied as superphosphate (16 per cent P_2O_5 or 7 per cent P.).

One-half Phosphorus applied as basic slag (16 per cent P_2O_5 or 7 per cent P).

All potassium applied as muriate of potash (KCL—48 per cent K_2O or 40 per cent K).

3. To locate a point on diagram V. Example, point XVII:
Find N by counting heavy lines *from opposite side*—2.5.
Find P by counting heavy lines *from opposite side*—2.5.
Find K by counting heavy lines *from opposite side*—5.0.
Therefore ratio N-P-K is 2.5-2.5-5 or formula N-P_2O_5-K_2O is 4-8-10.

4. Each of the formulae represented by the eighteen numbered points is to be tried in three different amounts—chosen as being correct within some range of possibility (table I). Example, in No. IX, if we use less than the amounts in IX C, the fertilizer would very likely be deficient in K; or, if more than IX A, it would likely be too high in P, and thus be surpassed by some other point.

5. To calculate mixtures. Example No. IX (pounds per acre):—

Point IX reads as ratio 2-6-2 (N-P-K) or formula 2-12-2.5 (N-P_2O_5-K_2O).
No. IX A calls for 40 pounds N, 120 pounds P and 40 pounds K.
No. IX B calls for 30 pounds N, 90 pounds P and 30 pounds K.
No. IX C calls for 20 pounds N, 60 pounds P and 20 pounds K.
Table I explains the amounts of chemicals to be taken.

EXPERIMENT "A"—TABLE II.

5. Table II gives directions for mixing, on basis of one-fortieth acre plots. The whole amount is first mixed up and then divided for the three applications.

Example—No. IX mixture.—Take *total* nitrate of soda from table I (IX A plus IX B plus IX C) and divide by one-fortieth. Similarly, take corresponding amounts of the other ingredients. Now thoroughly mix the whole and then divide into three portions (A, B, and C) in the ratio of 4 to 3 to 2, as in table I.

6. The mixing for plots A to D will now also be easily understood.

EXPERIMENT "B." TO FIND THE MOST EFFECTIVE ELEMENTS TO PUT IN A MIXTURE.

1. Keeping all other elements in excess, we apply the one to be investigated in diminishing amounts (as on left side table III).

2. For mixing, on basis of one-fortieth acre plots, take one-fortieth of these amounts and thoroughly mix each *separately* as on right hand side of table III.

3. The number of plots in experiment "B" will be fifteen.

EXPERIMENT "A",—Table I—(Pounds per acre.)

Plot.		N.				P.				K.	
		½ N.	15% N) $NaNO_3$	½ N.	(20% $(NH_4)_2SO_4$	½ P.	(7% P) Acid Phos.	½ P.	(7% P) Basic Slag.	K.	(40% K) KCL
I	A.	15	100	15	75						
	B.	11·25	75	11·25	56·25						
	C.	7·5	50	7·5	37·5						
II.	A.	20	133	20	100	20	286	20	286		
	B.	15	100	15	75	15	214	15	214		
	C.	10	66·5	10	50	10	143	10	143		
III	A.					25	357	25	357		
	B.					18	257	18	257		
	C.					10	143	10	143		
IV	A.					25	357	25	357	50	125
	B.					18	257	18	257	36	90
	C.					10	143	10	143	20	50
V	A.									60	150
	B.									45	112·5
	C.									30	75
VI	A.	25	166	25	125					50	125
	B.	18	120	18	90					36	90
	C.	10	66·5	10	50					20	50
VII	A.	60	400	60	300	20	286	20	286	40	100
	B.	45	300	45	225	15	214	15	214	30	75
	C.	30	200	30	150	10	143	10	143	20	50
VIII	A.	40	266	40	200	40	571	40	571	40	100
	B.	30	200	30	150	30	428	30	428	30	75
	C.	20	133	20	100	20	286	20	286	20	50
IX	A.	20	133	20	100	60	857	60	857	40	100
	B.	15	100	15	75	45	643	45	643	30	75
	C.	10	66·5	10	50	30	428	30	428	20	50

X	A.	12	80	12	60	24	343	24	343	48	120
	B.	8·5	57	8·5	43	17	243	17	243	34	85
	C.	5	33·3	5	25	10	143	10	143	20	50
XI	A.	15	100	15	75	15	214	15	214	90	225
	B.	11·25	75	11·25	56·25	11·25	160·5	11·25	160·5	67·5	169
	C.	7·5	50	7·5	37·5	7·5	107	7·5	107	45	112·5
XII	A.	30	200	30	150	15	214	15	214	60	150
	B.	20	133	20	100	10	142	10	142	40	100
	C.	10	67	10	50	5	71	5	71	20	50
XIII	A.	26·66	177	26·66	133	20	286	20	286	40	100
	B.	20·	133	20	100	15	215	15	215	30	75
	C.	13·33	89	13·33	67	10	143	10	143	20	50
XIV	A.	20	133	20	100	27	386	27	386	40	100
	B.	15	100	15	75	20	286	20	286	30	75
	C.	10	66·5	10	50	13	186	13	186	20	50
XV	A.	15	100	15	75	15	214	15	214	40	100
	B.	11·25	75	11·25	56·25	11·25	160·5	11·25	160·5	30	75
	C.	7·5	50	7·5	37·5	7·5	107	7·5	107	20	50
XVI	A.	20	133	20	100	20	286	20	286	40	100
	B.	15	100	15	75	15	215	15	215	30	75
	C.	10	66·5	10	50	10	143	10	143	20	50
XVII	A.	15	100	15	75	15	214	15	214	60	150
	B.	11·25	75	11·25	56·25	11·25	160·5	11·25	160·5	45	112·5
	C.	7·5	50	7·5	37·5	7·5	107	7·5	107	30	75
XVIII	A.	20	133	20	100	40	572	40	572	40	100
	B.	15	100	15	75	30	428	30	428	30	75
	C.	10	66·5	10	50	20	286	20	286	20	50

Plot "A" mixture XVII B. + 15 Manure + nothing in second and third years. "E" 15 tons manure alone. "I" check plot.
"B" " " + 15 " + 175 pounds XVII B, second and third years. "F" $7\frac{1}{2}$ tons manure alone.
"C" " " + $7\frac{1}{2}$ " + nothing in second and third years. "G" check plot.
"D" " " + $7\frac{1}{2}$ " + 175 pounds XVII B in second and third years. "H" "

Directions for Mixing Fertilizers (Table II).

Mix.	N		P		K	Total.	Pounds Manure.	Apply on Plot.	On basis of plots one-fortieth acre.			
	15% $NaNO_3$	20% $(NH_4)_2SO_4$	16% Acid Phos.	16% Basic Slag.	48% KCl.				A.	B.	C.	Manure.
1	2·5	1·9				4·4		I	4·4			
2	3·33	2·5	7·15	7·15		20·13		II	20·13			
3			8·93	8·93		17·86		III	17·86			
4			8·93	8·93	3·2	21		IV	21			
5					3·75	3·75		V	3·95			
6	4·15	3·1			3·1	10·35		VI	10·35			
7	22·5	16·9	16·1	16·1	5·6	77·2		VII	34·3	25·7	17·2	
8	15	11·25	32·1	32·1	5·6	96		VIII	42·7	32	21·33	
9	7·5	5·6	48·2	48·2	5·6	115·1		IX	51·2	38·3	25·6	
10	4·25	3·2	18·2	18·2	6·4	50·25		X	23·65	16·75	9·85	
11	5·6	4·2	12	12	12·7	46·5		XI	20·66	15·5	10·33	
12	10	7·5	10·7	10·7	7·5	46·4		XII	23·2	15·5	7·7	
13	10	7·5	16·1	16·1	5·6	55·3		XIII	24·6	18·4	12·3	
14	7·5	5·6	21·45	21·45	5·6	61·6		XIV	27·4	20·5	13·7	
15	5·6	4·2	12	12	5·6	39·4		XV	17·5	13·1	8·8	
16	7·5	5·6	16·1	16·1	5·6	50·9		XVI	22·6	17	11·3	
17	5·6	4·2	12	12	8·45	42·25		XVII	18·8	14·08	9·4	
18	7·5	5·6	32·5	32·5	5·6	83·7		XVIII	37·2	27·9	18·6	
							750	A	14·1			750
							750	B	14·1			750
	7·5	5·6	16·1	16·1	11·25	56·5	375	C	14·1			375
							375	D	14·1			375
							750	E				750
							375	F				375
								G	(check plot).			
								H	(check plot).			

EXPERIMENT "B",—Table III—Fertilizer Experiment to Compare Different Forms of N, P, and K,
(One-half of each plot to be limed at rate of 1 ton limestone per acre.)

	YEAR.	CROP.	TREATMENT.
Rotation.....	first	potatoes	fertilized as below
	second	grain and clover	not fertilized
	third	clover hay	not fertilized

		FERTILIZER PER ACRE.							MIX AND APPLY ON (PLOTS ONE FORTIETH ACRE EACH)					
		$NaNO_3$.	$(NH_4)_2SO_4$	Acid Phos.	Basic Slag.	Bone.	KCl.	Plot.	$NaNO_3$.	$(NH_4)_2SO_4$	Acid Phos.	Basic Slag.	Bone.	KCl.
I	A...	133		200	200		150	I A...	3·33		5·0	5·0		3·8
	B...	100		200	200		150	B...	2·5		5·0	5·0		3·8
	C...	66		200	200		150	C...	1·65		5·0	5·0		3·8
II	A...		100	200	200		150	II A...		2·5	5·0	5·0		3·8
	B...		75	200	200		150	B...		1·9	5·0	5·0		3·8
	C...		50	200	200		150	C...		1·25	5·0	5·0		3·8
III	A...	100	75	400			150	III A...	2·5	1·9	10·0			3·8
	B...	100	75	300			150	B...	2·5	1·9	7·5			2·8
	C...	100	75	200			150	C...	2·5	1·9	5·0			3·8
IV	A...	100	75		400		150	IV A...	2·5	1·9		10·0		3·8
	B...	100	75		300		150	B...	2·5	1·9		7·5		3·8
	C...	100	75		200		150	C...	2·5	1·9		5·0		3·8
V	A...	100	75			350	150	V A...	2·5	1·9			8·8	3·8
	B...	100	75			263	150	B...	2·5	1·9			6·6	3·8
	C...	100	75			175	150	C...	2·5	1·9			4·4	3·8

POTATO PRODUCTION ON EXPERIMENTAL FARMS.

Details of Plan.

PREPARED BY H. T. GÜSSOW.

RULES FOR DISEASE ELIMINATION.

(**a**) In the seed tuber:—

1. The ideal seed potato should be free from all diseases or blemishes.

2. The presence of Powdery Scab shall disqualify potatoes for seed purposes.

3. When sorting potatoes for correct "seed" size, all bruised, decayed, externally diseased, or unsound tubers should be removed.

4. Tubers showing Common Scab should preferably be all removed. The chances are that scabby seed will produce a scabby crop. (See Note 2.)

5. After having removed all externally diseased and otherwise injured tubers, the seed should be soaked in bags or bulk for three hours in a solution of bichloride of mercury, 1 part in 2,000 parts of water. After treatment, spread out and dry. (See Note 1.)

6. When dry, cutting the potatoes for "sets" will commence. Provide each person engaged with a potato knife, and keep a number of knives in a pail containing a solution 1:1000 bichloride of mercury.

7. The stem end is the seat of several internal diseases. Cut a thin slice off the stem end of each potato; if prefectly sound and free from brown streaks, rings or spots, continue cutting it up to required size.

8. Discard at once all tubers showing discolouration at the stem end section and throw out those showing any kind of spotting inside, though the stem end has shown no disease.

9. After using the knife on a tuber showing any kind of discolouration, throw it at once into the disinfecting solution and take out another knife before cutting up a new tuber. The knife that has cut through a diseased tuber conveys certain diseases to the new tuber; hence it is very important to change the knife after having thrown out a diseased tuber. It is waste of time to cut out brown spots and use the rest of the tuber.

10. If these precautions have been followed, everything has been done to eliminate diseases conveyed by unsound seed potatoes. The sets are now ready for planting.

(**b**) In the growing plant:—

The elimination of diseases showing symptoms only in the growing plant will be carried on by means of field inspections by a trained inspector.

Field inspections will be made: (**a**) while the plants are in bloom, and (**b**) shortly before harvest. The inspector will remove or cause any diseased plants to be removed and immediately destroyed. The second inspection will be made for Late Blight and diseases in the new tubers. A detailed statement will be given the grower as to the state of his crop as far as freedom from disease is concerned.

Spraying (See Note 5).

1. Spraying is practised for two main reasons: first, to control the Colorado beetle; and second, to control Late Blight. There are other minor reasons.

2. Our experiments have shown that several solutions will destroy the Colorado beetle, but that the solution acting most rapidly is the best one to use.

3. Spraying must be done thoroughly. All plants, and all parts thereof, must be well covered. A plant with one-half sprayed and the other half missed will have the unsprayed part eaten off by the beetles very quickly. This will leave enough beetles to continue the pest. One spray thoroughly applied is better than several carelessly applied.

4. We recommend two special applications for beetles: one when the plants are from 4 to 6 inches high, to be followed by another from one to two weeks later. The interval between the sprays will naturally vary according to the severity of attack. The solution we use and recommend is made up as follows:—8 to 10 ounces of Paris green, 2 pounds arsenate of lead to 40 imperial gallons of water.

This solution adheres satisfactorily to the foliage and controls the ravages of the beetle. Spraying will generally commence towards the 1st of July.

5. After the first separate applications have been made, we continue spraying regularly once every week right up to harvest time, using "poisoned" Bordeaux mixture of the following composition:—6 pounds of lime, 4 pounds sulphate of copper, 12 ounces Paris green, 40 gallons of water.

6. Do not spray on very windy days. Spray early in the morning, or commence two hours before sunset. Postpone spraying in unsettled weather, but spray thoroughly, particularly after a period of rain.

Storing Seed Potatoes.

1. Remove all bruised, damaged or frozen tubers before placing them in storage, or decay is likely to follow.

2. Storage places should be dry, well ventilated, and cool. The temperature should be uniform and not below 33° F., and not above 38° F. Store potatoes in bulk, not in barrels or bags. Providing the tubers were mature when harvested, the losses in storage, amounting sometimes to more than one-third of the crop, will be greatly reduced, if not entirely eliminated.

NOTES.

(1) *Using Bichloride of Mercury.*

Bichloride of mercury is a deadly poison. While treating or drying treated potatoes, and when disposing of used solution, keep all farm animals away.

One pound of bichloride will make 200 imperial gallons of solution. The crude bichloride of mercury dissolves very slowly. Prepared bichloride, ensuring rapid solution, is costly. Use crude bichloride and pulverize it in a mortar. Cover the mortar with cloth; don't inhale the dust from the chemical. When one pound has been pulverized, divide it roughly into sixteen equal parts; empty it into a corresponding number of old bottles (white glass preferable) and fill them up with hot water. Shake or roll them about occasionally until dissolved. When dissolved pour contents into the required quantity of water, and the solution is ready for use.

Use solution only once. Formalin vapour and formalin solution are often recommended, but bichloride of mercury has given the best results all round.

(2) *In relation to Common Scab.*

From the disease point of view, stable manure should not be used for potatoes. This is likely to result in a scabby crop, which is largely averted by the use of fertilizers.

(3) *Arsenate of Lead.*

Use "Swift's" arsenate of lead; it comes in kegs in form of a soft paste. It readily dissolves with stirring.

(4) *Paris Green.*

One-pound packages are very handy. It does not dissolve, and should be held in suspension by constant agitation.

(5) *Bordeaux Mixture.*

Small quantities are easily made. For large quantities, systematic procedure should be followed, or preparation will be found bothersome. If 40 gallons mixture only are wanted, dissolve the 4 pounds of sulphate of copper in 2 gallons of boiling water. Slake 6 pounds of lime in a wooden pail and add enough water (3 gallons) to make a "milk"; pass through fine brass wire cloth strainer, or you will clog your spray nozzles. Keep a barrel ready filled with 35 gallons of water. Get one man to pour the sulphate of copper solution into the barrel, while another pours the lime water at the same rate—a third should stir the whole in the barrel finally add the required Paris green (12 ounces), and the solution is ready to use. Fill spray pump by passing solution again through brass wire cloth strainer.

For large quantities: (1) slake the lime in one or more barrels and fill them with the paste right to the top -always keep covered with water—or the lime surface will dry up and become lumpy and interfere with straining; (2) prepare a stock solution of sulphate of copper in such concentration that when using 1 gallon of stirred mixture, 1 pound of the chemical in solution is contained therein. To do this, dissolve 2 pounds of sulphate of copper in 2 gallons of hot water in the way described previously, and empty the 2 gallons into a barrel; keep on dissolving such lots of chemicals in 2 gallons of water until you have one or two barrels ful of the stock solution. If you take for use 1 gallon of "stock solution" you will have one pound of copper sulphate.

Procedure when making 40 gallons spray:—

You will require 4 pounds of copper and 6 pounds of lime (or lime in excess) Therefore, have a barrel containing some 35 gallons of water, and add to this 4 gallons of the sulphate of copper stock solution (or 4 pounds of dissolved chemical). Next add a quantity of lime paste with a shovel and stir well until dissolved. When dissolved, use a testing fluid to ascertain excess or deficiency of lime. Lime must be in excess or the potato foliage will burn. The test solution is as follows:—

One ounce potassium ferrocyanide dissolved in 1 pint of water. Fill this solution into a dropping bottle. Having added and dissolved the lime in the copper sulphate solution as described above, stir well the contents of the barrel and allow one minute to settle, then drop a few drops of test solution in it. If on striking the surface the drops falling in colour the liquid brownish, add more lime, stir and test again; if the mixture does not change colour, the solution contains the proper strength of lime.

There is no need to add accurately 6 pounds of lime. Lime will vary in composition, hence the test above prescribed is better than relying upon lime by weight.

Finally, add to each 40 gallons of spray the required quantity of Paris green, strain through strainer into pump, and solution is ready for spraying. Replenish stock solutions as required.

SPRAY PUMP.

We use an Aspinwall double cylinder two-horse pump, 40 gallons' capacity, and find it very satisfactory after careful adjustment. The more pressure you use the finer the spray, but the more solution is required.

Forty gallons of solution should spray 1 acre thoroughly. To spray 1 acre takes from 1¼ to 1¾ of an hour. Attend to the spray nozzles, keep them free from clogging.

PLAN OF EXPERIMENTS IN TOBACCO DIVISION.

The work of the Tobacco Division is chiefly devoted to the improvement of the different varieties of tobacco introduced years ago into Canada, and to experiment with new varieties that might be of interest to the Canadian growers.

The chief features of this work are the following: Systematic tests to ascertain the exact fertilizer formula suitable to the soil of the different tobacco-growing sections in Canada in order to secure the best net returns. In these tests, fertilizers are used in combination with barnyard manure, the latter being considered the best foundation for improving the fertility of the tobacco soils.

A close study of the different binder types is made at the Experimental Tobacco Stations of Quebec (St. Jacques l'Achigan and Farnham).

Different tobaccos for cigar fillers have also been tried in Quebec. The results have been encouraging as far as the aroma is concerned, but, unfortunately, the yield per acre is not yet sufficient to induce the growers to take up the growing of these interesting types.

In Ontario, at the Experimental Tobacco Station at Harrow, attention has been more particularly devoted to the study of the different conditions for the growing of White burley, and, more recently, for the growing of the bright tobaccos treated by the flue-curing process. (Bright Virginia type.)

The latter varieties have proved to be better adapted to the climatic and soil conditions of Ontario than the Seed Leaf types, which do better in the province of Quebec.

During the last few years the Tobacco Division has commenced special work in connection with breeding and selection. That work has given appreciable results, especially at the Central Experimental Farm, where the whole field grown in tobacco every year has been devoted to the production of tobacco seed. It might be well to mention that most of the tobacco seed distributed by the Division comes from tobacco grown at the Central Experimental Farm.

Particular attention has been paid at these stations to the handling of the tobacco crop at harvest time so as to avoid all kinds of damage to the leaf, as much as possible. The wilting

of the tobacco on the field is effected by means of scaffolds on which the plants are placed as soon as they have been speared on to the laths, and they are left for two or three days on the field before being taken to the curing barn. When necessary, canvas covers are spread over these scaffolds so as to prevent excessive cooling of the tobacco during the night, or damage by rain. In this manner the tobacco begins to yellow on the field, and the period of curing in the barn is greatly reduced, as it is possible to allow more ventilation at the beginning of the process in the curing barn, thus avoiding, to a large extent, the trouble generally known among tobacco growers as " pole burn."

Special attention has also been paid to the preparation and sowing of the seed-beds.

The results of our experiments along these lines are going to be published very shortly in bulletin form.

During the last few years, through the Tobacco Division, new varieties have been introduced, and some of the varieties acclimatized years ago in the country have been improved, especially the binder types and some of the pipe tobaccos grown in the province of Quebec.

It is expected that, beginning from the year 1915, a very thorough co-operation will be given to the Tobacco Division by some of the branch Farms in Quebec, Alberta, and British Columbia.

The programme of the work to be carried on at those Farms will be to ascertain the prospects for growing tobacco in the sections where they are located. In order to obtain these results the attention of our co-operators will be devoted to the following points:—

(a) The date on which one could transplant without running any risk of late frosts in the spring.

(b) The date on which the tobacco should be harvested in order to allow it to ripen thoroughly.

(c) The date of the first frosts in the autumn.

(d) How to top (there is a close relation between the number of leaves left on the plant and the time required for the ripening process).

(e) The yield per acre.

(f) The curing.

At Ottawa we would look after:—

(g) The comparison of those tobaccos with the products obtained from the same varieties in the other parts of the Dominion.

(h) Percentage of nicotine.

(i) Combustibility.

At the Experimental Stations in Quebec more attention will be devoted to the Seed Leaf types, and in some sections to the varieties generally known as Canadian tobaccos. The latter are very early growers, but need to be improved, as it is very difficult to secure seed of a pure strain. We must select and establish new types which will have to be tested and approved by the manufacturers.

At Lethbridge, in southern Alberta, the possibility of growing some of the filler types, binder types, and pipe tobaccos will be tested.

In British Columbia, owing to special climatic conditions, it will be impossible to experiment with other types; however, our chief attention must be devoted to the growing of the binder and filler types, especially on the coast. The bright tobaccos (flue-cured) might possibly be grown in some districts like the Okanagan valley, for instance. It is very doubtful whether they have any prospects on the coast on account of the damp climate.

At any rate, with the co-operation of the different Experimental Farms, it will be possible to gather sufficient data in a comparatively short time, and to know the different sections where tobacco can be grown profitably in Canada.

EXTRACT FROM AN ADDRESS

Delivered at an Ontario Dairy Convention by J. A. Ruddick, Dairy and Cold Storage Commissioner.

COMPARATIVE STATISTICS of the Dairying Industry expressed in terms of milk, showing production, exports, imports, and total and per capita consumption in the census years 1901 and 1911.

	Census 1901.	Census 1911.	Per cent of Increase or Decrease.
Population of Canada	5,371,315	7,204,838	+ 34·13
	Lb.	Lb.	
Total production of milk	6,866,834,000	9,871,178,103	+ 43·75
Exports of dairy products as milk	2,514,596,967	2,236,663,687	− 11·05
Imports of dairy products as milk	34,886,346	39,871,207	+ 14·28
Total consumption as milk	4,387,123,379	7,674,385,623	+ 74·92
Per capita consumption as milk	816·76	1,065·17	+ 30·41
No. milch cows in Canada	2,408,677	2,594,179	+ 7·70
Average pounds milk per cow	2,850	3,805	+ 33·50

NOTE.—As milk production was not included in the 1901 Census, the quantity shown in the 1901 column was arrived at as follows:—The total value of all dairy products in 1900 was $66,470,953, which included the manufactured value of cheese and butter made in factories, and the average gross value of the milk supplied to factories was 96·8 cents per hundred pounds. Taking this figure as a basis, the above total value represents a total milk production of 6,866,834,000 pounds.

A SUMMARY OF THE MAIN ACTIVITIES OF THE DAIRY AND COLD STORAGE BRANCH OF THE DEPARTMENT OF AGRICULTURE.

I.—DAIRYING.

Cow Testing.

Farmers are encouraged and assisted to keep records of the quantity of milk produced by each cow, for the purpose of distinguishing the profitable ones from those that are unprofitable.

Dairy Record Centres.

Dairy Record Centres are organized with an expert in charge who gives his whole time to a limited district and endeavours to get all the farmers in his territory to weigh each cow's milk and to take samples for testing.

Once a year a complete census of all the herds in the district is taken, with full particulars *re* breeding, feeding and means taken to improve the average production.

There are thirty-five of these Dairy Record Centres in operation in 1914. The department pays the salary ($1,200 per year) of these experts.

The propaganda in connection with the cow-testing movements consists of:—

(*a*) The publication of popular bulletins and circulars on the subject;

(*b*) The frequent preparation of short articles for the press dealing with various aspects of the work and citing specific cases of increase in milk yield as a result of systematic testing.

(*c*) Addresses given by recorders, provincial supervisors, and headquarters staff;

(*d*) Personal visits to farmers by recorders; and

(*e*) A very extensive correspondence.

The average production of milk in Canada has been increased by 1,000 pounds per cow since this work was started. With over two and a half million cows in Canada the value of the total annual production is thus increased by at least $25,000,000, and the work is only just begun.

A Model Cheese Factory.

A model cheese factory and creamery is operated at Finch, Ont., on a regular commercial basis. This establishment is conducted for the purpose of:—

(*a*) Demonstrating the advantages of certain improvements in the construction of cheese factory and creamery buildings;

(*b*) To determine the value of new apparatus and machinery and also new methods and practices in the manufacture of cheese and butter;

(*c*) To encourage the production of winter milk, and

(*d*) To encourage proper business methods in the management of factories, etc.

A Model Creamery.

A model creamery is operated at Brome, Que., for the same purposes and with the same objects in view as in the case of the factory at Finch.

Experimental and Demonstration Work.

Investigations and experiments relating to dairy manufactures, and the handling of milk, are conducted from time to time as occasion arises.

New processes are demonstrated and illustrated in order to bring them to the attention of those interested.

Lantern slides are used as far as possible in lecture and demonstration work.

II.—CREAMERY AND FARM COLD STORAGES.

A bonus of $100 is paid to any creamery that erects suitable cold storage rooms according to plans and specifications furnished free by the Department.

Working plans and specifications for small cold storages and dairies suitable for a farmer's use, are also distributed free to all who apply for them.

III.—REFRIGERATOR CAR SERVICES.

For Butter.

An arrangement is in force with the railway companies in Ontario, Quebec, and Nova Scotia, for a refrigerator car service for butter, covering the period from the middle of May to the middle of October. These cars are run weekly or fortnightly, according to the requirements of the route, on an advertised schedule, so that shippers can deliver their butter to the station with the least possible exposure to heat. A shipper may forward any quantity from one package upwards, and pay only the regular less-than-carload rate without extra charge for icing. The Department guarantees, on each car, two-thirds of the earnings of a minimum carload from starting point to destination, plus about two-thirds of the cost of icing. Inspectors are engaged at freight terminals to watch the unloading of these cars, to report on their condition and on the

temperature of the butter and the quantity of ice remaining in the bunkers. The reports are sent daily to headquarters at Ottawa, and any defects or deficiencies in the service are brought to the attention of the responsible railway authorities. In this way an efficient service is maintained.

For Cheese.

Commencing about the middle of June and extending for a period of eleven weeks, the Department pays the icing charges, up to $5 per car, on a limited number of refrigerator cars, when used for carload shipments of cheese from one station.

For Fruit.

A similar arrangement, except that there is no limit to the number of cars, is in force from the first of August to the first of October, for shipments of early apples and tender fruits, in carloads, consigned to Montreal and Quebec for export in cold storage.

IV.—RESERVED CHAMBERS FOR FRUIT.

Exporters of early apples and other tender fruits who wished to ship in cold storage from Montreal to the United Kingdom frequently found it difficult to do so, because the quantity they had to offer was so small that it was not worth while for a shipping company to operate a whole chamber to handle it exclusively, it not being permissible to carry fruit with other produce. To overcome this difficulty, the department through this branch has, for a number of years past, arranged with the steamship lines to different ports to have one chamber reserved for fruit on certain steamers sailing during the months of August, September, and part of October, the department guaranteeing a revenue equal to the earnings of one-half of the chamber. Of late years the chamber has nearly always been well filled.

V.—CARGO INSPECTION.

Cargo inspectors are stationed at Montreal, Quebec, Halifax, Liverpool, Bristol, London, Glasgow, and, in the the winter season, at Portland, Maine, to report the condition in which

perishable goods are delivered to and discharged from the steamships and to supervise the handling generally. A large number of self-recording thermometers, or thermographs, are used in this service, and the records of temperature thus obtained are available for interested shippers of fruit, cheese, meats, etc. A Canadian shipper may, by application to the Dairy and Cold Storage Commissioner, secure complete records of any consignment from the time the goods arrive at the loading port in Canada until they are distributed in the United Kingdom. This applies also, but not so generally, to shipments for South Africa and Australasia.

VI.—AN EXPERIMENTAL COLD STORAGE FOR FRUIT.

The experimental cold storage warehouse which has been erected at Grimsby, Ont., under the direction of the Dairy and Cold Storage Commissioner, is now in full working order.

The fruit growers in this district are now pretty generally convinced that in order to get the best results in catering to the Northwest or Old Country markets, or even for long distance shipment in Eastern Canada, it is absolutely necessary that tender fruit should be thoroughly cooled before shipment, and it only remains to demonstrate a satisfactory method that may be generally adopted with that end in view. Several schemes were proposed and discussed, including one for a large central car-cooling plant to serve the whole district, but after due consideration the plan of having a relatively small cold storage warehouse at each important shipping point seemed to give the greatest promise of successfully meeting the needs of the situation.

The growers of any particular locality naturally hesitate before making an investment which is more or less of an experiment, and as the results, when worked out at Grimsby, will be of value to the whole district and to other districts as well, the undertaking seems to be a fitting object of governmental initiative.

The control and operation of this cold storage warehouse by the Department is serving: (a) to demonstrate the advantages of the pre-cooling of fruit, and (b) to determine the practicability of pre-cooling in a warehouse rather than in the cars after loading.

Being fully equipped with every device for the purpose, it will afford excellent facilities for experimental investigations and the study of the problems connected with the storage and transportation of fruit, as well as those which relate to general cold storage work.

Incidentally the shippers of the Grimsby district will be able to use the warehouse for commercial pre-cooling and storage, on payment of the usual rates for such services.

VII.—THE ENFORCEMENT OF LAWS.

The Dairy and Cold Storage Commissioner is charged with the routine administration of: The Cold Storage Act, 1907; the Dairy Industry, Act 1914; and the Cold Storage Warehouse Act, 1914.

Dairy Laws.

The leading features of the Dairy Industry Act of 1914 are the sections which prohibit the importation, manufacture, or sale of:

(a) butter substitutes of any kind;

(b) renovated, or process butter;

(c) butter containing over 16 per cent of water; and

(d) cheese adulterated with fats other than the fat of milk.

The regulations under the Dairy Industry Act provide for the marking of dairy products in such a manner as to protect the honest trader and consumer from misrepresentation and fraud.

Cold Storage Laws.

The Cold Storage Act (chapter 6 7, Edward VII) of which the details of administration are also in the hands of the Dairy and Cold Storage Commissioner, is intended chiefly to encourage the erection of small local public cold storages warehouses for the preservation of perishable food products. It provides that the Government may grant a sum not exceeding 30 per cent of the total cost of site, equipment and construction of such public cold storage warehouses. The subsidy is paid in instalments, which are spread over a period of four years. No assistance is given to any company proposing to build in places where a public cold storage is already in existence. The rates charged

in subsidized warehouses are subject to the approval of the Governor in Council.

The Cold Storage Warehouse Act of 1914 gives the Governor in Council power to make regulations respecting the operation and control of cold storage warehouses.

VIII.—PUBLICATIONS AND INSTRUCTION.

An annual report is published showing in detail the work of the branch. Bulletins and circulars on various subjects are issued from time to time for free distribution.

Members of the staff address a large number of farmers' meetings throughout the year, officiate as judges at dairy exhibitions and at milking competitions, and through an extensive correspondence, act in an advisory capacity on a great variety of subjects.

VOTE OF THANKS.

At a meeting of the Superintendents and the Central Farm officers, held on Monday, January 18, the following resolution, passed by the former, was read:—

> "Whereas we, the Superintendents of the branch Farms and Stations, feel that this gathering has been of great benefit to us, in giving us new ideas and inspiration for the carrying on of our work, and that we have been the recipients of much courtesy, kindness, and hospitality during our stay in Ottawa:—
>
> "Resolved, that we ask the Director to convey to the Hon. Minister of Agriculture our thanks for the making possible of such a gathering.
>
> "That we express to the Director our thanks for the trouble he has taken in arranging for the meetings and in giving us every facility for the best use of the limited time at our disposal, and for his courtesy and consideration in hearing our requests.
>
> "That we express to the Director, the heads of Divisions, and the various members of the staff of the Central Experimental Farm our thanks for the kindness they have shown in explaining to us their work here, answering questions, and discussing our work with us, and for their hospitality in entertaining us in their homes."

The sentiment expressed in this resolution was duly transmitted to the Minister of Agriculture in the following letter:—

OTTAWA, February 1, 1915.

The Honourable
The Minister of Agriculture,
Ottawa.

DEAR Mr. BURRELL,—At a Superintendents' meeting held here at the time of our recent conference, the following resolution was passed and, as requested therein, I beg to quote it herewith for your information:—

> "Whereas we, the Superintendents of the branch Farms and Stations, feel that this gathering has been of great benefit to us, in giving us new ideas and inspiration for the carrying on of our work, and that we have been the recipients of much courtesy, kindness and hospitality during our stay in Ottawa:—
>
> "Resolved that we ask the Director to convey to the Honourable Minister of Agriculture our thanks for the making possible of such a gathering."

Yours very truly,

J. H. GRISDALE,
Director.

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